With two Turkey Days staring us in the face, and Christmas just around the corner, we are in the throes of "viewing" with satisfaction instead of alarm as is the usual custom. The main reasons for this satisfaction are closer ties that have welded the Independent telephone industry during the past year and (2) there will be 2 turkeys to eat which probably is part of the "more abundant life".

▼

In the "more abundant life" vein we cannot neglect some of the features provided at the National Convention just passed. We speak of the manufacturers and suppliers who made their exhibits so attractive and educational that almost every visitor vowed they would be back for the 1940 meeting. The exhibitors go to great expense to introduce and show all their wares and deserve your business however small your orders may be. They are an integral part of the industry and are accepted as such.

▼

May we call your special attention to the Telephone Barometer on page 39. With October installations it has again gone over the top—your industry is growing—are you?

TELEPHONE ENGINEER

MANAGEMENT • ENGINEERING • MAINTENANCE

Vol. 43, No. 11 **November, 1939**

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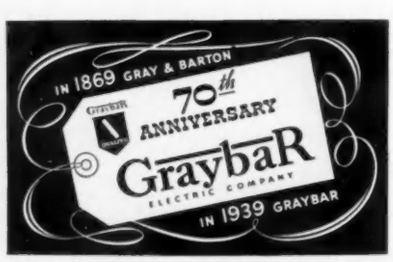

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National Association Convention Report

By RAY W. SMITH

Illustrated by Ray Blain

President-elect J. F. O'Connell
Madison, Wisconsin.

Before the largest assembled convention ever gathered, both in numbers of members and exhibitors, the United States Independent Telephone Association met in Chicago on October 10, held four rousing days of jam-packed meetings, elected popular J. F. O"Connell, president of the Commonwealth Telephone Co., as their president, and rang down the curtain with three attendance records smashed in as many years.

The election to the presidency of the Independents of J. F. O'Connell brings to the telephone industry a man well qualified to the position of leader. His many years of experience as a top executive means that a worthy, successor of B. L. Fisher has been found. Directors whose terms expired at this time were all re-elected.

Among those in attendance were many making their first pilgrimage to the National Association convention. These were brought, no doubt, by the outstanding job done by that body and its executives during the Association year. Many of the old standbys that had missed meetings durings the immediate past years were stirred from their lethargic attitude by a well planned program plus an activity in Association affairs that were climaxed in August by the single-handed victory of the Association in winning for their members one of the most important legal victories before the Congress telephone men have ever faced.

We are reproducing in this issue many candid pictures made by cameraman Ray Blain which gives a graphic picture of the convention. The meeting will go down in history as a record breaker but able Louis Pitcher, executive vice president, is already laying plans for a larger meeting in 1940 which would not be surprising as each meeting since his elevation to his executive position has been larger than its predessessor.

Ohio's Frank McKinney caught gossiping about old times with veteran P. Kerr Higgins, (right) one of the older telephone pioneers.

It remained for president B. L. Fisher to address the record breaking throng and bid them welcome. His service as president was marked by more association activity than in many years and it was with happy face and heart that he thus faced those that honored him last year with the leadership of their industry. He immediately plunged in to the business of the day. Following the invocation by Bishop Lynn Waldorf, of the Methodist Church, he requested the report of secretary C. C. Deering, Des Moines, Ia., who discussed membership and finances and introduced for ratification a new section of the by-laws pertaining to election and number of directors, which was unanimously carried.

In his address Mr. Fisher gave a complete resume of the Association year. He emphasized the importance of organization and paid tribute to the members in their activities in backing up the efforts of those guiding the Association destinies. The enthusiasm shown by Mr. Fisher was transmitted to his audience and they were well whetted with interest throughout his address. His report on his stewardship as president was greeted with heavy applause.

Louis Pitcher, as executive vice president, is the man that devotes full time to Association affairs and his address on "Association Affairs" delved into

And the ladies "God Bless 'em." Standing—l. to r.: Mrs. A. J. Parsons; Mrs. J. F. O'Connell, and Mrs. F. R. McBerty. Sitting: Mrs. Louis Pitcher; Mrs. E. C. Blomeyer, and Mrs. B. L. Fisher.

The official family of the Independent Pioneers: l. to r.: Secretary J. K. Johnston; retiring president J. C. Crowley Jr., and Sam H. Shutt, president-elect.

State Association executives attending the convention were dined by the National Assn. Top-State Association presidents. Lower—State secretaries. (George Butler —top left is the Texas Association secretary.)

the very heart of the industry problems of the Independents. His penetrating views on possible future developments regarding rates, toll compensation, litigation, etc., were climaxed by the work of the Association on problems that had been faced and SUCCESSFULLY met by the organization. Mr. Pitcher, as we go to press, is engaged in addressing a number of state Associations that are holding their conventions. This is only one of the reasons of his popularity and success as the executive in charge of Association activities.

Addressing the Independents for the last time as their Washington representative, Mr. Alfred L. Geiger, gave his report on Washington activities which included the all important wage-hour legislation. He also brought to light the matter of utility companies and their fight from molestation by regulatory bodies. Mr. Geiger has resigned to enter private practice in Washington.

A memorial tribute to the late George A. Yanochowski was read and the nominating committee appointed to end the first session.

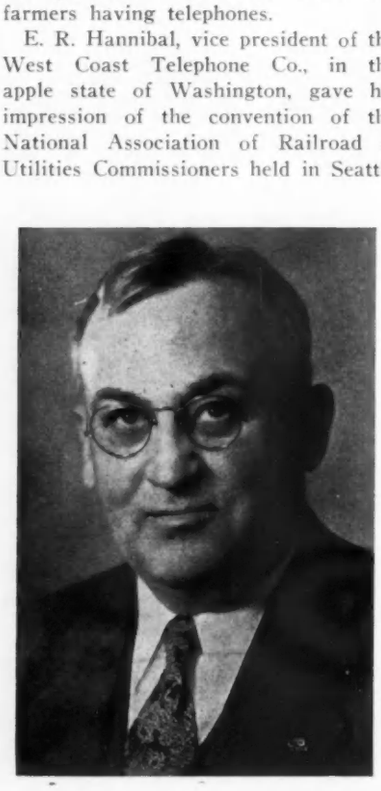
With Louis Pitcher presiding, the dinner to executives of the visiting state associations was held the evening of Oct. 10. Much value is attached to this feature as it allows frank discussions and closer relationship between the National body and state associations. All remaining state convention dates were also discussed. We are reproducing pictures of state executives above.

Mr. R. M. Bruce, vice president of the Rochester (N.Y.) Telephone Corp., handled the subject of "Employer-Employee Relations" as the first speaker on the second day. He cited actual examples of public relations and the importance of employee relations. Surprising to many but proven by the speaker was his idea that he considered the first few years of employment as a trial and adjustment period which gives both employer and employee the opportunity to determine if their occupation is best suited to their mutual advantage. His words and paper were based on 40 years of experience.

Report of the Nominating Committee was presented by Chairman R. A. Lumpkin, Mattoon, Ill., whose committee suggested re-election of directors whose terms had expired, resulting in unanimous ballot on motion and rules suspension for the vote. These directors are listed in this issue.

Report of special committees then reported. Mr. Edwin M. Blakeslee, Madison, Wis., handled the report of the Toll Compensating Committee and informed the assemblage that a 200 page report had been presented to the board of directors concerning toll traffic agreements and compensation arrangements. R. C. Reno, Ft. Wayne, Ind., chairman of the Fire Insurance Committee presented the report for that committee which is endeavoring to arrange lower insurance rates for farmers having telephones.

E. R. Hannibal, vice president of the West Coast Telephone Co., in the apple state of Washington, gave his impression of the convention of the National Association of Railroad & Utilities Commissioners held in Seattle recently. We quote one significant remark: "Most of the commissioners seemed to be hard-working individuals, honestly trying to do good jobs in their chosen fields.



Louis Pitcher, Chicago Re-elected as Executive Vice-President of the Association.

Mrs. V. E. Chaney, Mrs. Allen S. Crane, and Mrs. G. B. Foscue snapped on the exhibit floor opening day.

J. R. Porter, Tarboro, N. Car., visits with Leich Sales' general manager Roy W. Siemund.

The Wage-Hour Committee headed by Chairman John H. Agee, Lincoln, Nebr., and Vice-Chairman E. C. Blomeyer, Chicago, were on hand with their entire membership consisting of W. C. Henry, Bellevue, O.; J. F. O'Connell, Madison, Wis., and R. A. Phillips, Sioux City, Iowa. Mr. Agee made the report and brought cheers from the members on recounting some of the tribulations of his committee before their victory in having the Congress amend the Wage-Hour law to exempt telephone companies with less than 500 stations. He reported that the committee hoped to be able to disseminate information on the many questions now before the industry as quickly as interpretations from the Wage-Hour administration are received in answer to interrogations sent them many weeks previous to the meeting. Questions and answers followed and on completion Mr. James N. Cox, Cookeville, Tenn., read a resolution of appreciation to that committee which was adopted by rising vote. A motion by C. C. Deering to thank Senator Herring of Iowa and Congressmen Harrington, Iowa and Ramspeck of Georgia, was unanimously carried.

Association Officers

President, J. F. O'Connell, Madison, Wisconsin
Executive Vice-President, Louis Pitcher, Chicago, Illinois
Vice-President, John H. Wright, Jamestown, New York
Vice-President, W. C. Henry, Bellevue, Ohio
Secretary-Treasurer, Chas. C. Deering, Des Moines, Iowa

EDWIN M. BLAKESLEE, Madison, Wis., Chairman of Toll Compensating Comm.

Executive Committee

Chairman, J. F. O'Connell, Madison, Wisconsin
J. H. Agee, Lincoln, Nebraska
H. E. Billington, Chicago, Illinois
E. C. Blomeyer, Chicago, Illinois
J. P. Boylan, Rochester, New York
P. M. Ferguson, Mankato, Minnesota
B. L. Fisher, Martinsville, Virginia
G. B. Foscue, Chicago, Illinois
W. C. Henry, Bellevue, Ohio
F. R. McBerty, Galion, Ohio
George A. Scoville, Rochester, New York

The third morning was devoted to meetings on accounting, plant and traffic which were held in separate sections. Chairman C. D. D'Oust, general auditor, Commonwealth Telephone Corp., Madison, Wis., presided at the Accounting Conference at which two subjects were discussed. Introducing the first subject, Mr. L. C. Evenson, Lafayette, Ind., discussed "Various Methods Used in Spreading Accounts" with particular stress on the spreading of charges in the uniform system of accounts on accounts 702 to 707 inclusive, which were handled each separately. The second discussion was presented by Joseph F. Coenen, Madison, Wis., and pertained to the 1939 changes in the unemployment tax provisions of the Social Security Act. Excellent attendance were noted at this meeting.

The Plant Conference, with Chairman E. W. Olschner, chief engineer of the South Carolina Tel. & Tel. Co., Tarboro, presiding, was unusually well attended as subjects prepared were of particular interest to small as well as large exchanges. His introductory remarks were on "Economical Design of Plant for Small Exchanges." His subject was distributed in mimeographed sheets which are available to our readers.

Mr. Walter Dakin, general plant superintendent, central group of operating companies, General Telephone Corp., delivered a paper on poles, etc. for long-span open-wire and cable construction. He also discussed the problems of profitable operation of telephone companies with emphasis on the engineering and designing of plant to further the savings. Mr. Dakin recommended the use of the new high strength open-wire construction and the lengthening of cable spans to effect economy in rural line construction. Other speakers at this conference included discussions by K. B. Shotte, Jr., general manager of the Kittanning (Pa.) Telephone Co.; J. B. Haley, Clinton, Ill., and R. V. Achatz, Aurora, Ind.

Chairman Sam H. Shutt, vice president of the Texas Telephone Company and newly elected president of the Independent Pioneers, was in charge of the Commercial Conference and reported record attendance of over 100. His remarks on management as the real subject was appropos and followed by discussion on the cost of metallicizing rural telephone lines necessitated by REA construction. Mr. R. B. Still, vice president and general manager of the Wabash Telephone Co., Bloomington, Ill., elaborated on his experience on the electrification program of the government. Other discussions were handled by L. D. Densmore, Sioux City, Ia.; Allen S. Crane, Portsmouth (O.) Home Telephone Company and H. F. McCulla, Lincoln (Nebr.) Tel. & Tel. Co. Others heard were H. G. Nellis, Tomah, Wis.; W. H. Daubendick, Remsen, Ia.; A. J. Parsons, Springfield, and Max Hosea, Greenfield, Ind. B. C. Schweitzer, Owosso, Mich. delivered a very interesting paper on Business Communication Ailments. Several others entered into the discussions.

E. W. OLSCHNER, Tarboro, N. Car., Chairman of the Plant Conference.

At Left: "Bill" McIlvane, of Copperweld Steel poses one of the visitors as the "Copperweld Lineman." (Above) W. W. Ege, Copperwelds' Chicago manager, as the "finished product."

The registration on the first day. Discernable are F. O. Cuppy, George Butler, Mr. and Mrs. Allen Crane. The Associations' Mrs. Cureton and Froelich are lower center while Telephone Engineer's Isabel Rice is shown in lower left.

Changing to larger rooms made necessary by larger attendance, the program on the afternoon of the third day was devoted to the feature speakers: The Hon. Albert Gore, congressman from Tennessee and Dr. David Friday, noted economist, of Washington, D. C. A full house greeted the speakers who took full advantage of the occasion. These two addresses alone would have amply repaid any telephone man for attending the convention. Mr. Pitcher is to be congratulated on securing such outstanding talent to address the convention.

The closing session opened with secretary treasurer Deering in charge. S. J. Russell, regional representative of the Social Security Board, Washington, addressed the meeting with a summary of that Law and traced its history to the present which included the amendment passed in 1939. W. D. Keefer, director industrial safety division, National Safety Council, Chicago, delivered the final paper on the "Task of Preventing Employee Accident". The meeting was then adjourned.

In retrospect the highlights were the record number of exhibitors numbering in all a total of 66—more than ever before. The banquet given by the Independent Pioneers from contributions of manufacturers, suppliers, and operating companies. The unusual number of big-wigs of the industry in attendance, and, last but not least, the well-planned, thoughtful program that provided enough meat for everyone to profit handsomely from their attendance.

Retiring president B. L. Fisher, Martinsville, Va., is to be especially praised for the worthy Association year just passed. During his tenure of office he has set many records of achievement which ended with the all-time high record that was accomplished by bringing together the largest assemblage of Independents ever gathered.

NEW PIONEER PRESIDENT

When the Independent Pioneers Telephone Association selected Sam H. Shutt, general manager of the Texas Telephone Co., Sherman, as its president during the October meeting they honored a pioneer of 43 years service to the telephone industry. A strapping Texan, his shoulders are wide enough to carry these new honors as he has led a life in the Southwest where honors have been bestowed on him by many civic groups who selected him to lead the Lion's Club, Chamber of Commerce, Rotary, and many other organizations including his local country club, where incidentally he pursues his only hobby, golf. He started his telephone career in 1896.

The 1939 meeting of the Pioneers was the largest ever held and when retiring president J. C. Crowley, Jr., Minneapolis, opened the session it was before an enthusiastic membership. Report of secretary J. K. Johnston, Indianapolis, was read and approved. "Dusty" Miller, philosopher and humorist was feature speaker. The banquet extended by the Pioneers was the main entertainment of the convention with over 1600 in attendance.

The incoming president has a history in the industry that includes service of 20 years to his Texas Telephone Association. He is now 1st vice president of that body. He is well known nationally as he has attended every national meeting since 1919 and during the past two years has served as Chairman of the Commercial Committee. He served as representative of the Texas association in Washington when the Federal Communications Act was pending. We predict a most successful year for the Pioneers with this "pioneer" at the helm.

SAM H. SHUTT

Convention Dates

Alabama Independent Telephone Association, Jefferson Davis Hotel, Montgomery, November 17 and 18.

Minnesota Telephone Association, Hotel Radisson, Minneapolis, January 23, 24 and 25, 1940.

Nebraska Telephone Association, Hotel Fort Kearney, Kearney, April 9 and 10, 1940.

Indiana Telephone Association, Claypool Hotel, Indianapolis, May 8 and 9.

Pennsylvania Independent Telephone Association, Yorktowne Hotel, York, May 16 and 17, 1940.

The Illinois Telephone Association, Hotel Pere Marquette, Peoria, May 28 and 29, 1940.

New York State Telephone Association, Hotel Syracuse, Syracuse, June 5 and 6, 1940.

New Phone Dial for Extensions

We quote, without further authentication, the following from the October 20, issue of the Cincinnati (Ohio) Star:

"Dialing direct to telephone extension numbers is possible by a device claimed to have been invented by two Soviet scientists. After being connected to a private branch exchange, a caller is enabled by the device to dial to the extension required, thus eliminating the operator. The inventors have also perfected a very small automatic branch exchange for large offices and institutions, says a Moscow report."

Short Course in Telephone Transmission

By
B. C. BURDEN

The Telephone Repeater

General

In the design of toll circuits iron wire is used where the circuits are relatively short and where the comparatively high transmission loss of iron wire will not result in a circuit whose overall loss will be greater than that considered a satisfactory maximum for the type of toll line involved. Where the length of line involved would result in unsatisfactory transmission then copper wire must be used.

No. 104 copper wire offers only 22% as much loss as No. 109 wire, hence, copper circuits can be roughly 4½ times longer than iron circuits for the same transmission efficiency.

To illustrate in terms of miles assume that 16db is allotted as the maximum loss for the wire portion of a toll circuit then if No. 109 iron is used the circuit can be only 53 miles long, but with No. 104 copper the circuit could be 235 miles in length.

When the length of a toll circuit is such that even No. 104 copper will not give satisfactory transmission then No. 128 or No. 165 copper wire must be employed as these larger sizes permit more miles of circuit for a given loss.

For open wire toll circuits more than a few hundred miles in length it is necessary to employ either loading coils or amplifiers to partially offset the circuit loss.

In the early days loading coils were used on open wire toll lines in order to reduce the transmission loss and thereby extend the range of long distance service. After the development of the telephone repeater making possible as it did trans-continental toll service, the use of loading on open wire lines was discontinued and the repeater alone relied on to overcome line losses. On toll cable circuits both loading and repeaters are used. We will discuss in this article the theory and general features of the telephone repeater.

Repeater Element

The term "telephone repeater" as commonly used refers to the complete assembly of apparatus which is used to provide amplification in a telephone line.

The most essential part of a repeater is the **amplifying element.** It is this element that boosts the weak incoming voice currents and sends them out with sufficient strength to reach the listening telephone, or the next repeater.

The first repeaters made use of a carbon microphone type of amplifying element. These elements were successful from the standpoint of boosting the

Charts for Previous Installment

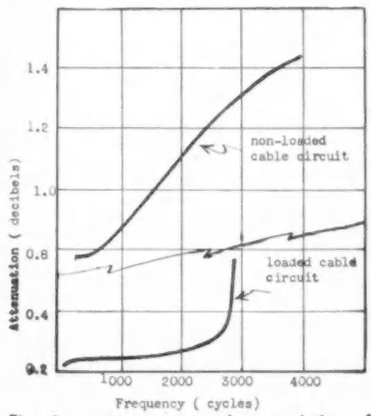
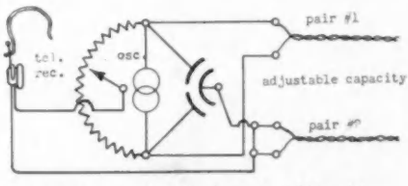


Fig. 9 — Attenuation characteristics of loaded and non-loaded cable.



Note--The above schematic shows connections when bridge is set for testing unbalance between side circuit (pair #1) and phantom (pair #2).

Fig. 10—Schematic of capacity unbalance bridge.

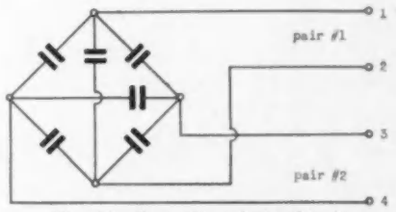
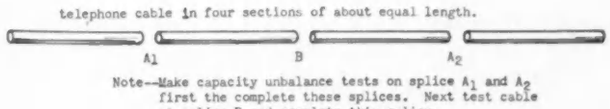


Fig. 12—Capacity relationship in cable quad.



Note--Make capacity unbalance tests on splice A_1 and A_2 first the complete these splices. Next test cable at splice B and complete this splice.

Fig. 11—Method of balancing several lengths of new cable.

Type of Circuit	Loss Per Mile
No. 19 ga—non loaded circuit	1.09 db
No. 19 ga—174 mili-henry at 9000 feet	0.33 db
No. 19 ga—174 mili-henry at 6000 feet	0.28 db
No. 19 ga— 44 mili-henry at 6000 feet	0.48 db

Table No. 1—Comparative Efficiency of Typical Loaded and Non-Loaded Cable Circuits.

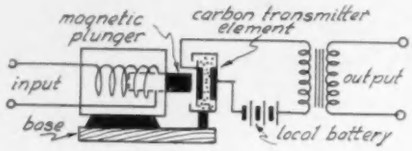


Fig. 1—Construction of Early Carbon Repeater Element.

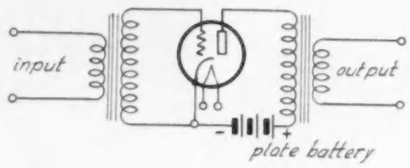


Fig. 2—Basic Vacuum Tube Amplifier Circuit.

voice currents but had several disadvantages, viz: (1) They tended to distort the voice waves, and (2) They were somewhat unstable in amplifying characteristics hence difficult to maintain. Figure 1 shows schematically the essential parts of the early carbon type repeater element, which incidentally were known as the **Shreeve Repeater Element.** The incoming voice waves were applied to the actuating winding which by operation of the carbon chamber caused the voice waves to be reproduced in amplified form.

Following the development of the three element tube it was promptly adopted as the ideal repeater element for it was both stable in amplification characteristics and relatively free from distortion. It quickly replaced the Shreeve type element and all repeaters now use vacuum tubes.

A schematic of a simple vacuum tube amplifier circuit is shown in Figure 2.

The Vacuum Tube a One-Way Amplifier

At first thought it would seem that the design of a telephone repeater is a simple problem requiring primarily the insertion of an amplifying element in the telephone circuit.

Unfortunately, however, the problem is not quite so simple, for the reason that a vacuum tube is not a "two way" amplifying device. That is, if you apply the weak incoming telephone voice wave to the grid circuit of the tube, there will appear in the plate circuit of the tube an amplified version of the incoming voice wave. However, if an incoming voice wave is applied to the plate circuit of the vacuum tube it will have no effect on the grid circuit hence does not pass through the tube.

Thus it can be seen that if we merely insert a vacuum tube amplifier in a telephone line as shown in Figure 3, it will act as a repeater in one direction only, hence, would make the line inoperative from a telephone standpoint.

It might seem that we could connect the input and output circuits together, as shown in Figure 4, that the tube would amplify in both directions, but it would not. In fact such a connection would render the amplifier entirely inoperative as it would **oscillate** (sing).

The Balancing Transformer

All of which brings us to the question "How can a vacuum tube be connected in a telephone line so as to amplify in both directions?"

This problem was answered by the use of a three winding transformer connected to the vacuum tube and telephone circuit, as shown in Figure 5.

Such an arrangement acts very much like a **Wheatstone Bridge.** The incoming voice wave from either direction will pass through the tube and be amplified yet the output circuit of the tube will not feed energy back to the input circuit if the circuit is properly balanced. The simple theory of the three winding transformer is usually explained by the use of several schematics showing the action when a voltage is applied at various points in a repeater circuit, such as that of Figure 5.

Action of Balancing Transformer

Referring to Figure 6, which shows schematically the several impedances involved and their relationship to the transformer windings, let us first consider the action when transmission is from west to east.

Under this assumption the voice voltage would appear in series with impedance Z1. (Z1 represents the characteristic impedance of the west line). This voice voltage causes a current to flow through transformer winding 1-2 and through Z3 (Z3 represents the input impedance of the vacuum tube amplifier).

The impedance of Z4 (Z4 represents the output impedance of the amplifier) is of such value that as it appears across winding 1-2 it is exactly equal to impedance Z3. Inasmuch as the same current flows through Z3 **and** wdg. 1-2 the voltage drop across these two impedances will be equal. The voltage induced in winding 2-3 will also be equal to that across wdg. 1-2, or across Z3 due to the polarity connection of wdg. 2-3 with respect to wdg. 1-2 the net voltage available to force current through Z2 (the characteristic impedance of the east line) will be zero hence the incoming energy from the west terminal will divide equally between the input to the amplifier, and the output circuit of the amplifier. No energy (under the ideal condition) will pass directly from the west line to the east line.

The energy which passes into the plate circuit will be wasted, and the energy which passes into the grid (input) circuit of the tube will, of course, be amplified and pass on to the distant terminal. It is important to note at this point that in transmitting energy into the repeater we have lost one half (3 decibel loss) of our original energy hence this loss must be made up by the amplifier element.

Action in the Output Circuit

In order to show how the energy leaves the amplifier it is necessary to use another illustration in which the voice voltage appears in the plate circuit which in terms of our schematic means in series with Z4. Referring

(Please turn to page 30)

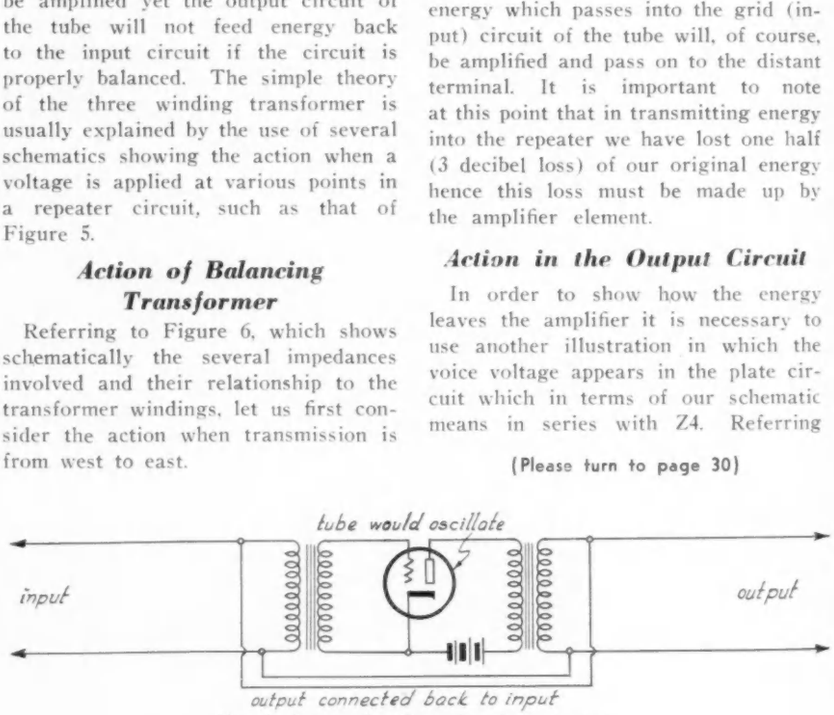


Fig. 4—Inoperative Repeater Arrangement.

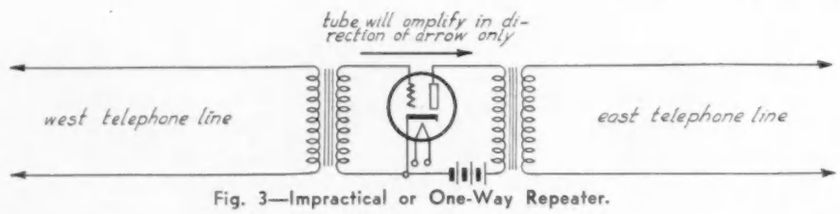


Fig. 3—Impractical or One-Way Repeater.

Note that two poles on the old lead, the poles with crossarms, are located in one span of the new cable lead.

If there is any doubt that one guy will not hold a corner properly then install several anchors and guys. A total of six separate guys and anchors installed on this pole.

Note that the center of the span barely clears the small trees underneath.

Long-Span Cable Construction

By
RAY BLAIN

THE prevailing opinion of telephone men at the present time indicates that considerable saving in aerial cable construction may now be effected by taking advantage of the high-strength of suspension strand available. This possibility has, we believe, been made available at the proper time now when aerial cable is rapidly being extended greater distances out into the country from many exchanges to replace heavy open wire leads. There are numerous locations in this country where underground or buried cable will not prove-in and in all such cases it is believed that the possibilities of long-span aerial cable construction should be investigated.

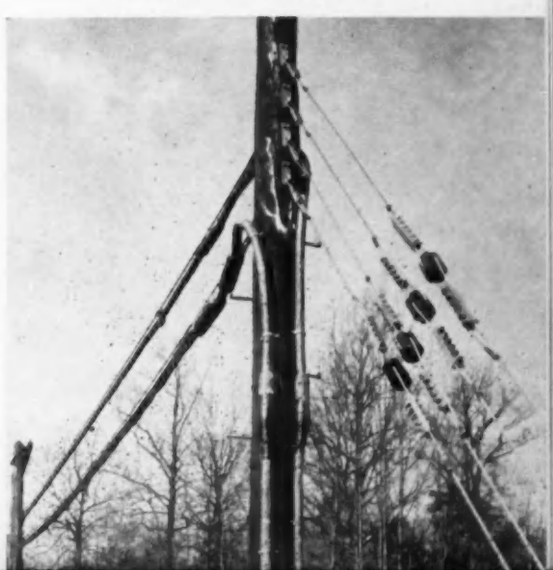
When long-span cable construction is mentioned the question is immediately asked as to whether this type of construction will cause a greater amount of trouble than the shorter spans commonly used in the past. In this we doubt seriously that anyone has anything definite on the subject though offhand we are inclined to believe that it will cause less trouble if properly installed. Ring cuts near poles cause the majority of troubles on aerial cable and if fewer poles are used the possibility of trouble from this source is correspondingly reduced. Also it has been learned from expensive experience that aerial cable supported on a tight strand has a greater tendency to creep and vibrate than when considerable slack is left in each span. With the longer spans a greater sag is necessary and we are of the opinion that creeping and vibration with its accompanying crystalization will be held to a minimum when this type of construction is used.

Some also claim that the sway is greater with the longer span and while this may be true we believe it is likewise slower. The trouble usually caused on aerial cable, as mentioned above, is generally due to sway causing a twisting action of the cable in the rings near each pole. It seems reasonable to assume that this twist may be more easily absorbed without actually moving the cable in the rings in a long span than on a short one. However, for those who fear trouble from ring cuts at poles suitable special rings may be obtained which have proved entirely satisfactory and trouble free. There also appear to be possibilities in the new lashing method which weaves wire around the cable and supports it close to the messenger strand.

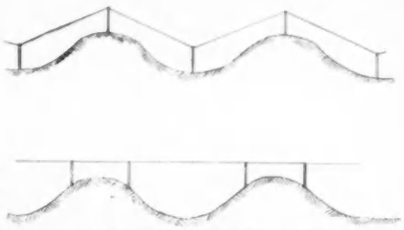
TO PROVE successful long-span cable construction must always be engineered with extreme care, sags and tensions calculated carefully and all corners adequately guyed. Poles must be of sufficient strength to properly support the added strength of the longer spans. The question of the proper span length to use for aerial cable construction in rural areas is one that is much debated at the present time. However, until something more definite has been learned in this connection we will only refer to the fact that in the past cable spans of 150 feet were commonly used and at the present time these span lengths have been increased to 200 feet and over with every indication that they will prove entirely successful. Some companies who have replaced aerial open wire leads with cable have removed every other pole. However, to make this arrangement possible poles must necessarily be of sufficient size to carry the cable load and of a height to provide proper clearance. Contrary to general belief if the cable is directly over the fence row, the center of the span need not clear the ground over 9 feet.

Some telephone men are of the opinion that the terrain in their particular state is not well suited to long-span cable construction. While we agree that the construction of any aerial line is made considerably easier in a level country, we do not agree that hills should prohibit the use of long-span construction. We are, in fact, of the opinion that hills and river crossings

Corners for long-span cable construction must be well guyed. This cable deadend has four heavy guys and anchors but will hold forever.



New long-span lead run parallel to old lead with crossarms. Note extra long-span on new.



The top sketch indicates how extra strain may be placed on a cable lead by having all spans of equal length over hilly country. Note the up-pull in the valleys and down-pull on the hills. The bottom sketch indicates how the same line may be freed of these extra stresses by making use of long-span construction and spans of unequal length.

caused the first long-spans to be built and made us acquainted with the numerous possibilities of this type of construction. Take for example when a line must be built over two hills with a valley between them. The conventional method is to space spans of equal length, both on top of the hills and in the valley. Then when the messenger or wires are strung there will be a heavy down-pull on the poles located on the hill tops with a corresponding up-pull on those located in the valley. On the other hand if poles are placed on the hill tops only and the valleys spanned there will be less tension on the strand or wires than when it is pulled down in the valley. Naturally extra large valleys cannot be spanned but in such cases a better grade of the line may be obtained without adding extra strain to the line as when it is pulled down to poles located in a small valley.

An arrangement used by the power companies which it is believed could be successfully adopted by all telephone companies is to place two poles, spaced fairly close on hill tops with a longer span across the valleys. This not only divides the strain between the two poles but shortens the long-span over what it would be if a single pole was placed directly on the hill tops.

GREAT improvements have been made in 7-wire strand during the past several years. Not only is the present-day strand stronger but it does not have the stretching properties that the old soft strand did that we were compelled to use in the past. Many old timers will remember how strand would be pulled to a proper tension then when the weight of the cable had been on it for a period of time, would stretch like the collar of the old turtle neck sweaters so popular in those days. Various grades of strand in all sizes is now available but only the 3/8 inch normal outside diameter size will be mentioned here. This strand has a weight of about 273 pounds per 1000 feet. The minimum breaking strength in pounds for the (Single and extra galvanized) is 4250 pounds; Siemens-Martin (Extra Galvanized 6950 pounds: High-Strength (extre-galvanized) 10800 pounds; and Extra High-Strength 15400 pounds. While either of these grades will be found entirely satisfactory it is believed that ordinarily either the high-strength or the extra high-strength, should be used for long-span aerial cable construction.

Copperweld strand with a nomial 7/16 inch consisting of seven No. 7 A. W. G. wires with an actual diameter of .433 inches of 30% conductivity copper has a breaking load of 16,890 pounds. The ½" copperweld strand has a breaking strength of 20,420 pounds. This strand is especially suited for aerial cable construction in any location, and especially where corrosive trouble may be expected.

Long-span cable construction along a crooked country road. Note how corner poles are placed away from road to provide clearance in center of span.

As previously stated the proper sag in messenger strand is most important for long-span cable construction. The sag should always be measured in the exact span center and accurately. Ordinarily a span of 150 feet, supporting a 100 pair, 22 ga. cable, at 60 degrees F. should have at least 31 inches of sag in it. A longer span should have a corresponding greater sag. When spans vary in length the shorter will naturally have less sag than the ones of greater length.

A proper sag may be obtained by several different methods all of which will ordinarily prove successful if used properly. Perhaps the most simple method is to place targets, constructed of lath on two center poles of the pull and sight the messenger in place as it is pulled. When this method is used allowance must be made for the increase in sag due to the weight of the cable in place and this is not ordinarily an easy task.

A MORE convenient and usually more accurate means of pulling cable to the proper tension is the oscillation method. This can be accomplished by throwing a line over the center of a span, pulling it down hard and then releasing quickly. This action causes the strand to oscillate up and down and the oscillations may be counted for a given period of time to indicate the tension of the strand. Strand of a certain tension will oscillate at a fixed frequency. A table may be obtained which indicates the number of oscillations which must be obtained for certain tensions at specified span lengths.

Perhaps the most satisfactory method to use to insure that all strand is strung to the proper tension is to make use of a strand dynamometer. This instrument may now be obtained in the direct reading type at a reasonable cost. The correct stringing tensions of different

(Please turn to page 28)

"Tapping In" On Washington

By ROLAND C. DAVIES
Editor
Telecommunications Reports

THE trend of political activities and the involvement of Federal Government policies in Washington during November and December are expected to show to a considerable degree the course and temper of the next session of Congress which convenes on January 4th.

Present indications are that the next Congress, while it will be pointing its legislative actions in a political spirit towards the 1940 Presidential election, will be generally conservative-minded and will not wish to rock the boat with any new reforms because such moves would throw obstacles in the path of the present business recovery. **If Congress should be in a conservative frame of mind, it will be highly significant for the telephone industry because the next session will consider the FCC Telephone Investigation Report and recommendations for expanded regulation by the Communications Commission in the telephone field.**

Whether the FCC Telephone Report is destined to receive much attention at the next Congress cannot be foretold with any real accuracy at this time. But the best speculation would indicate that the FCC's legislative recommendations to expand the telephone regulatory control will have hard sledding to gain a place in the Congressional "sun" because issues of far greater importance, such as national defense, taxation and labor problems, would be more than likely to crowd it out of the legislative picture.

The Senate and House Interstate Commerce Committees will be charged with the task of considering the voluminous FCC Telephone Investigation Report, which represents the findings and recommendations of the $1,500,000 three-year investigation of the American Telephone and Telegraph Co. and Bell System. Of course, the FCC will endeavor to arouse interest for Congressional action on the Report and the Senate and House committees will undoubtedly stage hearings on the various legislative recommendations. But whether the hearings will result in enactment of the FCC's recommendations will depend on the successful outcome of the committee sessions.

IT IS believed that the Senate committee may be more likely to launch the study of the Telephone Investigation Report, because Senator Wheeler of Montana, its chairman, has always supported increased Governmental regulation proposals. Senator Wheeler, who has definite Presidential ambitions might also deem the FCC Telephone Investigation with its assault on the nation's largest single business to be a good medium to gain publicity to aid his campaigning for the 1940 Democratic Presidential nomination. On the other hand, Senator Wheeler was known to have felt that the FCC Telephone Investigation, while it was being conducted, had failed to attain the full results as originally planned and he may still harbor this dissatisfaction so that he might be inclined to refrain from actively pushing the legislative consideration of the Investigation Report. The House Committee Chairman, Rep. Lea of California, is ranked as a conservative and, it is believed, would be disposed to be very cautious in taking up the FCC legislative recommendations because he and the other members of the House committee are well aware of the criticism of the Telephone Investigation that it was conducted in a wholly ex-parte manner without any presentation of the position of the telephone industry in the face of drastic and sweeping charges by the FCC against many phases of the telephone operations and service.

National Defense planning is certain to hold the center of the Congressional stage. This phase of the next session of Congress should produce some developments of interest to the telephone manufacturing industry. In the national defense programming, the War and Navy Departments are endeavoring to have as much "educational trial order" manufacturing of their needed supplies as possible. Under this scheme, it is expected that there will be some educational orders of telephone and radio equipment which will flow into the communications manufacturing field. An indication of this plan was recently given by Major General Joseph O. Mauborgne, Chief Signal Officer of the Army, who announced educational trial orders were to be placed with the communications manufacturing companies for the production of communications field wire, especially for telephone usage. General Mauborgne stated that in the event of a war the American military forces would need "mountains of wire" because of the modern phases of aviation raids with their destruction of communications facilities. Citing that there are approximately 30,000 items of equipment used by the Signal Corps, the General stressed that the Army needs for wire demanded greater durability and ruggedness than exists in commercial type wire, because telephone wire in war-time lies on the ground and must withstand difficult climatic conditions and contact with marching troops and the mechanized units.

FCC to Seek Increased Appropriation for Telephone Regulation

An increase of approximately $1,000,000 in its next year's appropriation which will contain an allotment of several

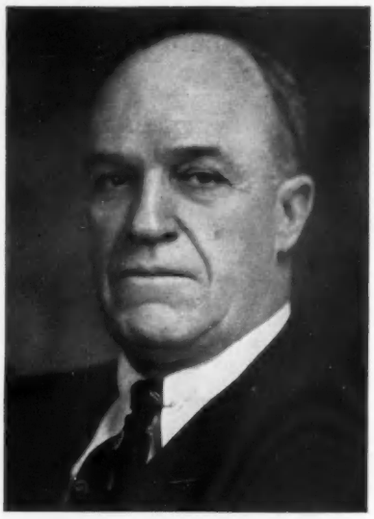
hundred thousand dollars for expanded telephone regulation has been requested by the FCC of the Budget Bureau. The current appropriation of the Commission is $1,838,175 and the new fund is being sought for the fiscal year, commencing July 1, 1940.

Whether the FCC will obtain the entire proposed increase, boosting its current budget by one-third, seems somewhat doubtful as the Budget Bureau usually pares down the funds requests of Government departments and the House Appropriations Committee also as a rule shaves down further the estimates given by the Budget Bureau.

THE proposed expansion of telephone regulation might lead to the reestablishment of the telephone rate and research division of the Commission, which was created during the Telephone Investigation and is advocated in the FCC's Telephone Investigation Report now before Congress. Another phase of increased telephone regulation is projected in the establishment of several field accounting offices to delve into the accounts of the telephone operating companies, especially the Bell System companies. These proposed field offices would be located in San Francisco, St. Louis and Atlanta and possibly Chicago. If the rate and research division was recreated, one of its principal tasks would be to aid state commissions in their gathering of material and financial data for the rate cases against telephone companies.

Another important phase of the proposed increased appropriation would call for the expenditure of between $300,000 and $400,000 for new equipment for the FCC's radio monitoring stations. The Commission, because of the war situation, is charged with the difficult task of patrolling the ether lanes to prevent any illegal radio stations from transmitting unneutral and espionage information. A most important sector to guard against such radio operations would be along the sparsely populated Mexican border. The FCC has seven "fixed" monitoring stations, the main one being at Grand Island, Neb., with others at Baltimore, Boston, Atlanta, New Orleans, the Great Lakes, San Diego and Portland, Oregon. What is needed most for the neutrality radio inspections is the purchase of a number of portable mobile radio monitoring stations to be used in watching the ultra-high frequency spectrum.

While the FCC is conducting its monitoring program, the amateur radio operators are likewise operating a self-policing system. The American Radio Relay League shortly after the outbreak of the war set up a plan of having 150 key amateur radio stations patrol the air all the time to prevent unneutral transmissions by amateurs.



C. C. Deering, Des Moines, re-elected secretary-treasurer of the National Association.

Association Directors Re-elected

Frank S. Barnes, Rock Hill, S. C.
A. O. Black, Butler, Pa.
J. P. Boylan, Rochester, N. Y.
Oscar Burton, Tyler, Texas.
V. E. Chaney, Kansas City, Mo.
H. M. Engh, Erie, Pa.
P. M. Ferguson, Mankato, Minn.
G. B. Foscue, Chicago, Ill.
W. C. Henry, Bellevue, Ohio.
Herman Hoerl, Marshfield, Wis.
C. F. Mason, Santa Monica, Calif.
J. F. O'Connell, Madison, Wis.
H. E. Billington, Chicago, Ill. (new).

Wage-Hour Officials Formulating Policies for Telephone Industry

THE problems of the best method of computing the average number of telephone stations of an exchange and of determining the learner wage rates for student switchboard operators constitute the two major questions which are now being studied by the Wage-Hour Division. It is believed possible that rulings on these two questions may be formulated by the Wage-Hour officials within the next month or two.

The Independent Telephone industry and the Bell System are to be asked to submit data on these two subjects for a study by Col. Philip Fleming, the new Wage-Hour chieftain, and his legal department. An informal conference on the wage-hour problems of the telephone industry was recently held with Col. Fleming by John H. Agee, chairman of the Wage-Hour Committee of the U. S. Independent Telephone Association and vice president of the Lincoln, Neb., Telephone and Telegraph Co., and S. A. Lane, Washington representative of the Association.

The Wage-Hour Division legal officials in their study of the Congressional amendment which exempts switchboard operators of exchanges with less than 500 stations are inclined to formulate the count of stations on the same basis as the telephone industry computes its telephone stations. Extension telephones, party-line telephones and telephones on private branch exchanges all would be counted as stations. The Wage-Hour officials also expect to include the switching or service stations on rural subscriber-owned lines in the count for each exchange. While the switching station status has not been finally determined, it was indicated that the ultimate outcome of the Division's studies would include this type of stations in the exchange computation.

It is deemed a possibility that a hearing on the telephone industry's wage-hour problems might be held later by the Wage-Hour Division and an industry committee would be formed to determine the various questions arising under that law. There is no plan at present to issue an interpretative bulletin on the legal analysis of the telephone exemption amendment. The Wage-Hour Division and an industry committee would be formed to determine the various questions arising under that law. There is no plan at present to issue an interpretative bulletin on the legal analysis of the telephone exemption amendment. The Wage-Hour officials feel the best method of handling any problems of the industry can be done by answering the requests of individual companies, based on the facts of each case.

In regard to student operators, the Wage-Hour legal officials hold the viewpoint that the telephone service may not be an industry which requires the employment of learners under the meaning which is provided in Section 14 of the Fair Labor Standards Act. In other words, The Division legal officials are inclined to feel student operators cannot be considered as learners during their training period like apprentices in other industries. However, the representatives of the U. S. Independent Telephone Association and the Bell System are expected

(Please turn to page 31)

Maurice K. McGrath Elected President of Kellogg Switchboard & Supply Co.

THE directors of the Kellogg Switchboard & Supply Company, at a meeting on October 31st, elected Mr. Maurice K. McGrath to the presidency. Mr. McGrath succeeds Mr. J. G. Kellogg who resigns but who retains his directorship in the company and will continue to be active in the company's affairs. Mr. Kellogg's retirement from the presidency is the result of his desire to be freed of some of his responsibilities so that he may be able to devote more time to his other interests. His material financial interest in the Kellogg Company remains unchanged, and his long experience in the business and his intimate knowledge of the telephone field will be available, as it has always been in the past to the officers and personnel of the company.

The new president brings to the company a broad knowledge of the telephone field, for Mr. McGrath has been associated with the communication industry for the past 44 years. His interest in telephony can almost be termed hereditary because his father was an intimate friend and associate of Theodore Vail in the early days of the United States Railway Mail Service, and together they burned the midnight oil before Vail left the government service to make telephone history.

Mr. Maurice K. McGrath started his telephone career in 1895 in the Western Electric shops when they were located on Clinton Street, Chicago, and worked his way through the drafting room to the charge of circuit work and finally the leadership of the Chicago experimental laboratory. In 1904 a call came for an assistant chief for the Bell Manufacturing Company in Antwerp, Belgium, then the company's largest foreign factory, and Mr. McGrath was chosen for the job. Mr. McGrath arrived in Belgium with his bride and spent the next five years introducing common battery equipment on the continent.

Maurice K. McGrath

In 1909 the Italian government inaugurated an extensive program of consolidation and reconstruction of telephone plants in all the principal cities and Mr. McGrath went to Rome to found the Italian branch of the Western Electric Company as its chief engineer.

This program of modernization along American lines included the planning of many big city telephone installations under unusual conditions which included the hurried installation of temporary central offices in fifteenth century palaces which had been taken over by the government from defunct noble families. Naturally the architects of prior centuries left no blueprints or specifications and a major problem was to calculate the stresses which could be borne by the ancient masonry arches and to distribute the weight of twentieth century equipment accordingly. The Tripolitan War of 1911 delayed this program and it was finally abandoned at the outbreak of the World War. At this time Mr. McGrath returned to America and the Bell Laboratories in New York.

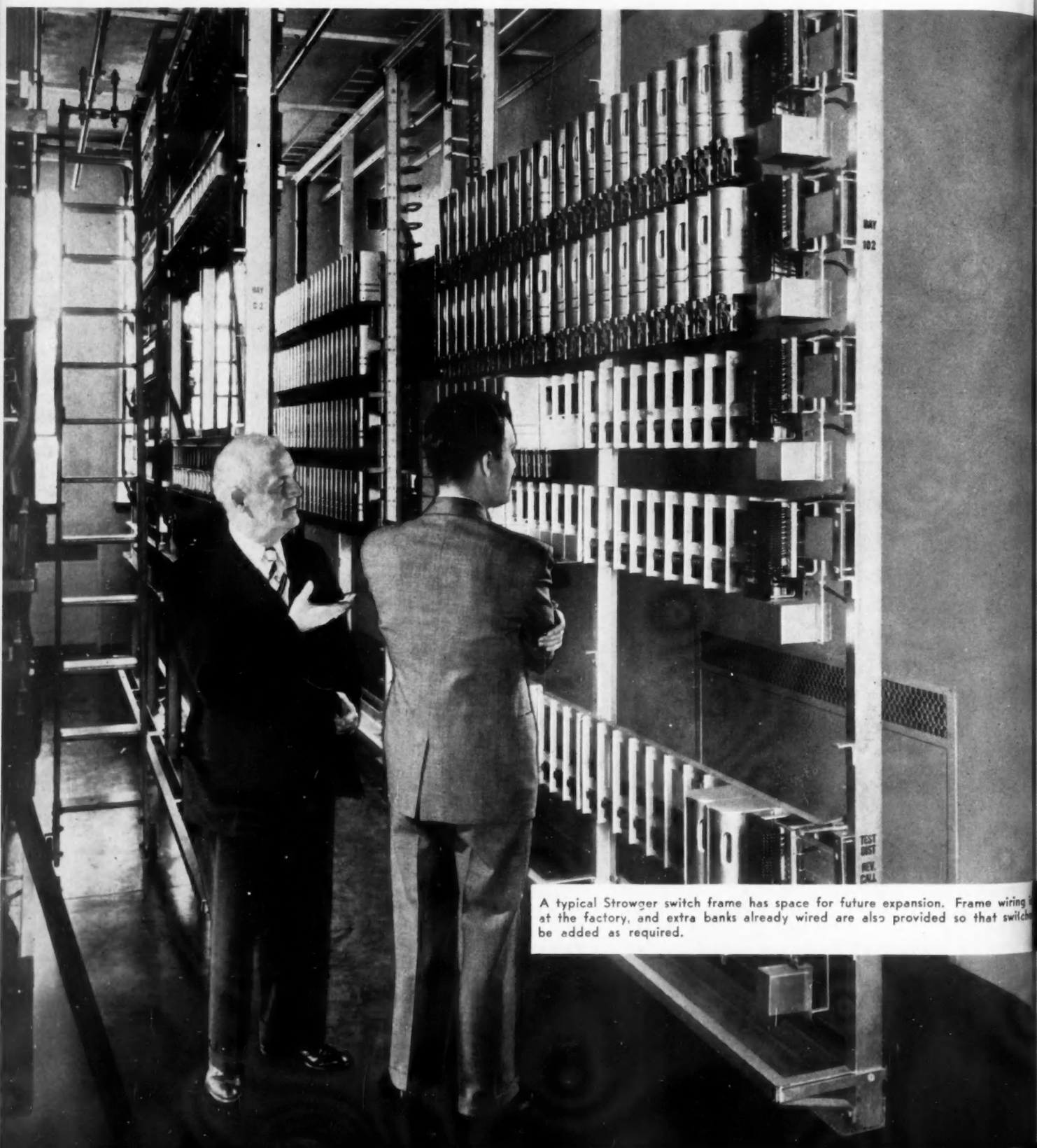
The entrance of the United States into the war became obvious in 1916 and Mr. McGrath began to prepare himself by attending the officers' training camp at Plattsburgh and later joined the Officers Reserve Corps. At the declaration of war by the United States, he was chosen to command the Signal Corps Radio Company which he organized among his friends in the Bell laboratories.

Before the company was called to active duty, however, General Pershing and his staff had reached France and a call came back for the organization of a scientific and technical division for the Signal Corps, to study the many new communication and observation problems arising in modern warfare; and to obtain, inspect, and maintain the multitude of new types of radio, electrical and physical apparatus that modern armies had developed. The War Department requested General J. J. Carty to organize such a unit which, according to British precedent was known as the Research and Inspection Division. Major H. H. Shreeve, inventor of the first practical telephone repeater, was placed in command of the division; Dr. Oliver Buckley, now Director of Research of the Bell laboratories, commanded the research section; and Captain, later Major, McGrath organized and commanded the technical section. In this division there were some of the brightest technical minds in the United States, some of whom, like Major Armstrong, have acquired enduring fame.

As soon as possible after peace was declared, Mr. McGrath secured his discharge to become manager and then managing director of the Western Electric Company's interests in France. At this time dial telephones and loaded and repeatered toll cables were just coming into general use and the manufacturing problems were many. Paris, with nearly 400,000 stations, was, of course, a major problem in itself.

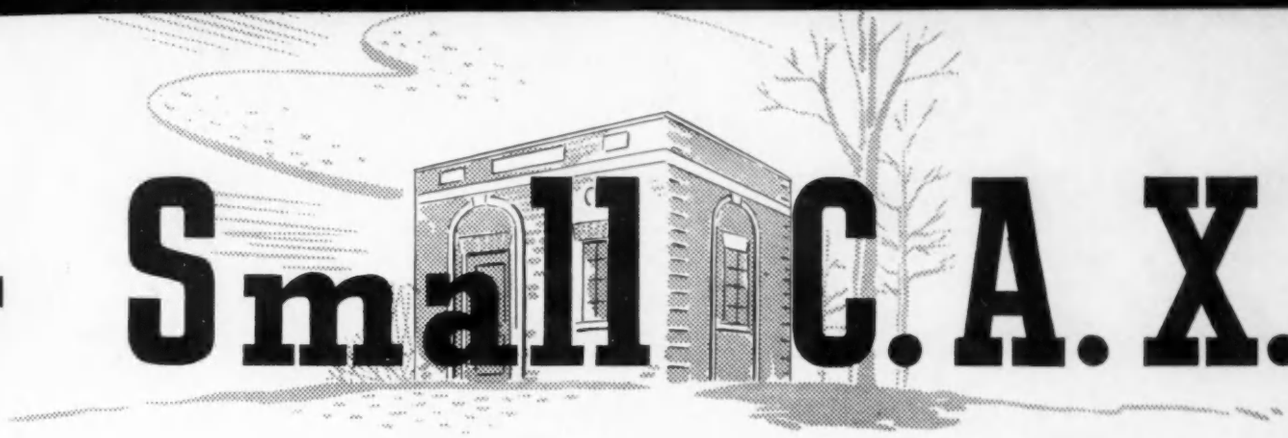
Fourteen years ago Mr. McGrath left

LARGE EXCHANGE



A typical Strowger switch frame has space for future expansion. Frame wiring at the factory, and extra banks already wired are also provided so that switch be added as required.

for Small C.A.X.



Strowger Automatic Switchboards are easy to expand. That's why approximately 75% of the world's automatic telephones are Strowger!

The traffic capacity of Strowger Automatic step-by-step exchanges of any size can be added to or changed with unparalleled speed and economy. This is due to the fundamental design of this equipment, which permits links to be added easily and quickly and over-all capacity increased by merely jacking in additional switch units.

The unique flexibility of Strowger Automatic step-by-step equipment constitutes a decided advantage for the user, since traffic changes and increases often occur unexpectedly and not always in accordance with forecast. Even when complete new "shelves" and "frames" are required, this equipment can be readily expanded by your own personnel and without interruption to service.

Because of this unusual flexibility, Strowger Automatic step-by-step exchanges of every size can cope with changing traffic conditions speedily and economicallv. can change or expand their capacity without the expensive necessity of reinstalling or rebuilding the exchange all over again. Write today for information regarding this fundamental difference between Strowger Automatic step-by-step and other systems, and what it means to you in dollars and cents.

To add any Strowger switch to an existing "shelf" the switchman—

merely slips the switch into the frame, where the jack springs automatically make connections,—

fastens the bank supports, adjusts the wipers and snaps the dust cover into place. The switch is then ready for duty.

AUTOMATIC ELECTRIC

MAKERS OF TELEPHONE, SIGNALING AND COMMUNICATION APPARATUS
ELECTRICAL ENGINEERS, DESIGNERS AND CONSULTANTS

Distributors in U. S. and Possessions:
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the Bell System to go with the International Telephone & Telegraph Company when that organization entered the manufacturing field and took over the foreign interests of the Western Electric Company. At that time the I. T. & T.. had just secured a national telephone franchise in Spain and set up a European general staff in London, which Mr. McGrath joined in 1929. There he was in active charge of publicity and public relations for the system in Europe with the duty of coordinating such efforts in its many companies in nearly forty countries outside of the United States.

Mr. McGrath's work in this capacity required organizing ability and diplomacy. He was frequently called upon to handle ceremonies connected with the inauguration of various services. Naturally, the handling of the inauguration of telephone service in Vatican City by Pope Pius IX and the trans-Atlantic conversation between King Alfonso and the late President Coolidge with Court and Cabinet in attendance, required careful planning to prevent mishaps. And while they are something to look back upon with pride, the work of organization at the time included an enormous mass of varied detail.

In 1932, the foreign general staff of I. T. & T. was greatly reduced and Mr. McGrath returned to America as Vice President of the Postal Telgeraph-Cable Company with headquarters in his native city of Chicago. This brought him into the Independent operating field. He sponsored the plan to establish Postal Telegraph agencies in Independent telephone offices and was actively engaged in offering this cooperative service to the Independent companies. The program was consummated with phenomenal success and resulted in considerable additional revenue to the Independent operators. In this work he made many additional friends in this field.

Mr. McGrath's qualifications and experience fit him admirably for the executive post to which he has been elected by the Kellogg Company. He announces that the tried and proved policies of the company will be continued and that the company will, as always, endeavor to lead in the development and manufacture of the kind and quality of equipment which is needed by the operating companies.

Long Span Cable Construction

(Continued from page 22)

strands at various temperatures are indicated in a special table. This method is not only faster than the sighting or oscillating method but is also more accurate.

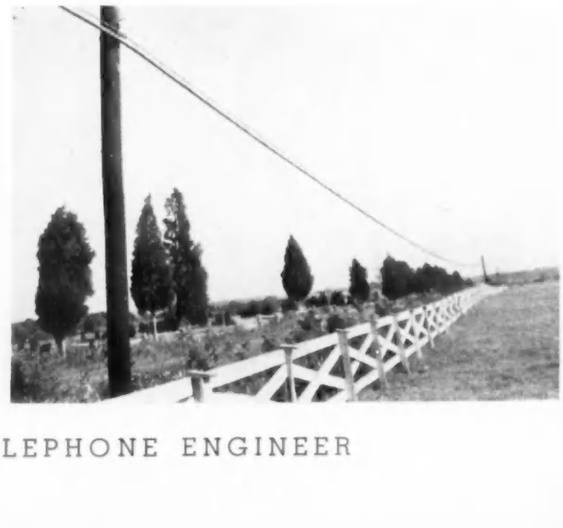
While adequate guying is necessary on any telephone line it is even more important on long-span cable construction, as the strains on corners are naturally greater than with shorter spans and it is quite important that they hold with a very little give or settling. There is no doubt but that patent type anchors are entirely suited for this purpose if the correct type for a certain soil is selected and then properly installed. We consider all patent anchors of the present time good for the purpose for which they are intended. Naturally anchors to hold well must be set to the proper depth and no one has ever experienced trouble by setting anchors too deep. Buy long anchor rods and then set them down deep in the earth and play safe. Also when in doubt as to the holding power of a certain anchor set an extra one and play safe. This plan will prove cheaper than taking chances on losing a corner. Some seem to be of the opinion that only one anchor and guy may be placed on a single pole which is a most serious error. Install two, three or even more seperate anchors and guys if that number is considered necessary to safely hold the strain. The strand dynamometer may also be used to advantage in some cases to indicate whether or not a certain anchor is overloaded.

THE question has often been asked as to whether suspension strand and guys for long-span construction should be terminated on the pole by the eye-bolt or wrap method. In our opinion either method will prove satisfactory if properly performed. The average construction man will prefer the eye-bolt method because it is more convenient to install and does not have a choking effect on the pole. Ordinarily the ¾ inch eye-bolt is used on 6000 pound strand and 1 inch on the 10,000 pound size and larger. Ordinarily two 3-bolt guy clamps should be used to insure safety on all deadends in connection with long-span cable construction. While one clamp will ordinarily carry the strain, the second one increases the cost only slightly and is considered desirable, as it increases the margin of safety considerably.

We prefer the use of a 3-bolt suspension clamp and a through bolt to attach the strand to each pole. A standard reinforcement strap should be used on each pole where it is considered that the extra strain makes them necessary. Reinforcement links should be used on all attachments where the pull is directly away from the pole.

Splices in suspension strand should be avoided when possible though in a lead several miles in length some of these splices must necessarily be made. When a splice is made a strand connector, which is in reality a metal strain insulator, should be used. Ordinarily four, 3-bolt clamps should be used to complete one of these strand splices.

Rings to support the cable should ordinarily be of the same for long-span construction as that commonly used for spans of conventional length. Ordinarily they will be spaced 20 inches apart except in special cases as over railroad tracks where they are generally reduced to 12 inches. When installing rings on new strand wire, for pulling-in either a heavier line or the cable itself should be placed in them. Considerable work may also be avoided by pulling the cable through a lead sleeve at each location where a cable terminal is to be installed. This avoids the installation of a split sleeve later. In our opinion special rings, saddles or lash-



A good example of Long-Span cable construction.

ings should be used at each pole to avoid the possibility of ring cuts. Several different types of cable hangers are now available which support the cable close-up to the messenger and it is claimed eliminates all possibility of troublesome ring cuts.

WHILE it does not apply especially to long-span cable construction we would recommend that all cable terminals on such a cable lead be of the protected type and that every precaution be taken to prevent injury from lightning. We are also believers in the plan of placing a ground wire on at least each ten poles. This ground wire to be securely connected to the messenger strand.

While it is believed that cable installed on long-spans will be practically self anchoring and have very little tendency to creep it is considered desirable to install grade clamps at all points where creeping, even slightly could cause injury to the cable. This refers especially to locations such as corners, cable terminals, steep hills, etc. It is claimed that the hangers which keep the cable in close contact with the messenger also act as grade clamps to keep it firmly in place without even slight creeping.

While telephone construction men do not agree on the use of long-span cable construction they must admit that several of these installations have been made by some of the larger companies and indications to date are that they are due to prove entirely successful. Recently while driving through a certain southern state we noted a new cable lead being constructed parallel to an existing line. The new lead had exactly half the number of poles as the old and strange as it may seem presented a much better appearance. It does seem an extravagance when building a new lead to make use of a greater number of poles than actually necessary to properly support the cable. While we neither approve nor condemn this new method of construction, we have attempted in this short article to present all available facts in the cast with the hope that they may be of benefit to someone considering the use of this type of cable construction.

No Pay

An American who wanted to make a telephone call from a public telephone in Curacao asked the taxicab driver how much the call would cost and the driver said it wouldn't cost anything. It didn't either. Although there was a coin box, no money was requested before, during or after the call. Probably it's just a quaint old Dutch custom.

A. C. Reid Elected President Leich Electric Co.

A. C. REID, newly-elected president of Leich Electric Co., has been associated with that organization for 32 years.

ANNOUNCEMENT has been made of the election of A. C. Reid as president of Leich Electric Co., Genoa, Ill.—one of the pioneer telephone manufacturers in the Independent field. This action, taken at the annual meeting of the board of directors, was in recognition of Mr. Reid's administrative ability and comes as a fitting climax to his many years of service to the Leich organization.

At the same meeting of the directors, Roy W. Siemund, vice-president and general manager of Leich Sales Corp., was also elected vice-president of Leich Electric Co.

Prior to the meeting the directors were taken on a tour of inspection through the factory to view the many new machines and the new equipment installed in the past year. Particular interest was directed to the new transmission testing laboratory where the "artificial ear" and similar testing devices were demonstrated.

In commenting on the increased productive facilities, Mr. Reid stated that more people are employed in the factory at the present time than ever before in the history of the company.

In 1907 Mr. Reid joined the late O. M. Leich and associates to form the Cracraft-Leich Electric Co. During the company's early years he assisted in the establishment of various departments and in 1912, when the company's name was changed to Leich Electric Co. he became chief engineer. Upon the death of Mr. Leich in 1935 he became vice-president and general manager, which position he held at the time of his election to the presidency of the organization.

Among Mr. Reid's important contributions to the industry was a vibrating ringing converter to operate from 60-cycle alternating current, said to be the first ringing machine of its kind. He also pioneered in the development of harmonic and pulsating ringing and introduced one of the first pulsating harmonic systems for magneto telephone systems.

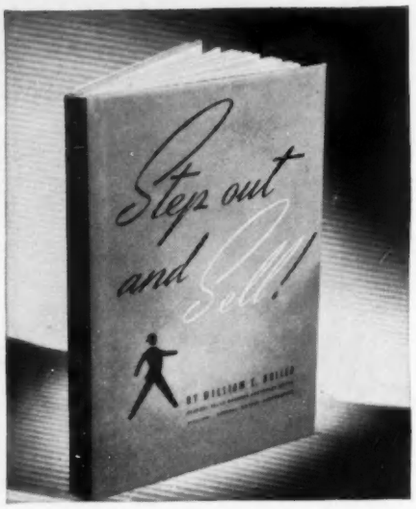
Another of his outstanding contributions was a "trickle" charging method of charging storage batteries. This method, it is said, led to the trickle charging of storage batteries along railway systems for the operation of signals—an arrangement that is widely used by American railroads today In conjunction with Mr. Leich, Mr. Reid also developed one of the first battery-signaling magneto telephones. When the handset vogue began, he originated a transmitter with submerged electrodes and cone-shaped diaphragm which is still featured in Leich handsets.

Mr. Reid has made his home in Genoa for 30 years and has taken an active part in community affairs. He is a member of the M. E. Church and has been president of the Genoa School Board for more than 20 years.

Station Gains

Principal telephone subsidiaries of the American Telephone and Telegraph company included in the Bell system showed a gain of 86,800 telephones in service during October, the company announced yesterday. The increase in telephones in operation for the preceding month was 93,000. For October, 1938, the gain was 58,400.

The cumulative gain by the Bell system during the first 10 months of this year amounted to 610,100 installments. This compared with a gain of 303,500 for the corresponding period last year.



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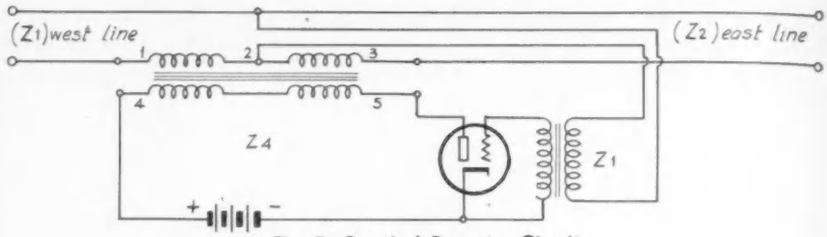

Fig. 5—Practical Repeater Circuit.

Short Course in Telephone Transmission

(Continued from page 20)

to Figure 7, it will be seen that the voltage at the output of the amplifier causes a current to flow through transformer winding 4-5 and this in turn induces a voltage in winding in the direction as shown by the arrows in winding 1-2 and 2-3. The equal voltages induces in windings 1-2 and 2-3 causes equal currents to flow through Z3 (the input to the amplifier) but these currents flow through Z3 in opposite directions hence the net voltage drop is zero and the output voltage does not reenter the input circuit of east transmission). Particular attention is focused on the fact that one half (3db) the amplified output energy is wasted. In other words in a perfect repeater we must necessarily lose one half of our input and one half of our output energy, hence, this 6 db loss must be offset by an equal (6 db) gain in our amplifying element before any net gain from the repeater can result. For example, a repeater whose amplifying element has a gain of 10 decibels, would offer a net gain in the telephone line of only 4 db. Actually in a practical repeater the net gain would be even less due to core loss in the transformer.

Summary

Summarizing what we have learned thus far regarding the repeater we

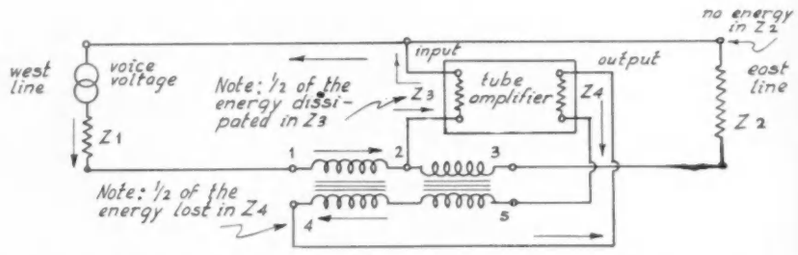

Fig. 6—Schematic Showing Action in Repeater when Transmitting West to East.

the amplifier (note if the output voltage did enter the amplifier input it would cause distortion and possibly oscillation which would interfere with the proper performance of the repeater.

It will be observed from what has just been stated that the amplified output energy has divided, one half going on to the east terminal and the other half being wasted in the west line (this statement based on west to

might say that it consists essentially of a vacuum tube amplifying element, **and** a balancing transformer and that these elements are so arranged that the incoming voice current, due to the action of the balancing transformer, automatically divide-one half of the energy being wasted in the output circuit and the other half passing into the input circuit of the vacuum tube amplifier.

(Next page please)

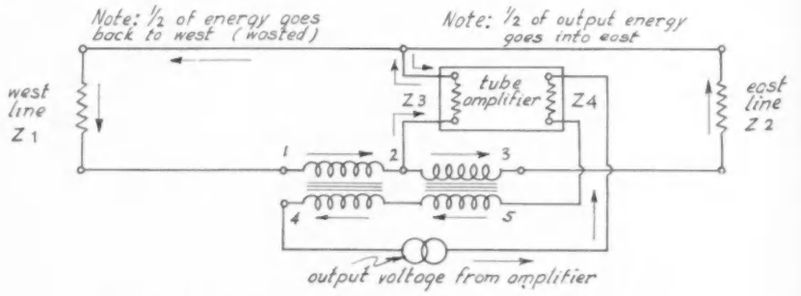

Fig. 7—Schematic Showing Action in Output Circuit of a Repeater.

In the output circuit the amplified energy divides-one half being wasted in the energy transmitted back toward the sending end, and the other half passes on to the receiving terminal. Due to the fact that we lose one half of our input and one half of our output energy we must supply at least 6 decibel gain in the amplifier to offset these fixed losses.

In next month's issue the modern telephone repeater circuit will be explained.

"Tapping In" on Washington

(Continued from page 24)

to present evidence later to counter this contention.

Two Important Telephone Cases Before Supreme Court

TWO important telephone regulatory cases are slated for decision by the U. S. Supreme Court during its present term—they are the question of the method used by the Pennsylvania Public Utility Commission in comparing intrastate toll rates with the interstate long distance charges and the appeal of the Wisconsin Public Service Commission on part of the rate reduction order against the Wisconsin Telephone Co.

The Supreme Court agreed to review by noting probable Federal jurisdiction the appeal of the Bell Telephone Co. of Pa. on the $600,000 intrastate toll rate reduction of that state commission because it had been predicated on a comparison of the intrastate charges with the level of interstate rates which had been established by the FCC. This case which will be probably argued during December presents a highly significant regulatory issue on whether a reduction of interstate toll rates can constitute discrimination against intrastate toll users when the intrastate rates are at a higher level. There are several similar situations of a higher level of intrastate toll rates above the interstate long distance charges structure in other states in different sections of the country. The Pennsylvania commission's rate reduction was upheld in a state superior court and the state supreme court refused to grant a review.

The Wisconsin telephone case marks another phase in the litigation over a long period of years on the series of rate reductions, ordered by the state commission which during that period was dominated by the LaFollette progressive group. The Wisconsin Commission was defeated in both the circuit court and state supreme court which handed down opinions castigating its procedure and ex-parte attitude as well as its valuation methods in determining the rate reductions. The Wisconsin commission after its recent revamping by the Republican governor decided to take an appeal to the U. S. Supreme Court on only a portion of the rate reduction order, promulgated by the predecessor body of LaFollette appointees, dealing with the 1936 order of cutting local exchange rates by $850,000 a year. The appeal will not bring before the U. S. Supreme Court the 1932 and 1933 rate slashes amounting to about $3,000,000 for those two years nor the 1934 order which was estimated at a $1,000,000 reduction for that year. While the appeal is being made to the U. S. Supreme Court, there is some doubt whether a "Federal" jurisdictional question is apparent in the case and if there is none the highest tribunal will undoubtedly refuse to review it.

Jurisdiction Over Interstate Exchange Rates Now Before FCC

WITHIN the next month the FCC may decide the interesting and important jurisdictional issue of whether

(Please turn to page 35)

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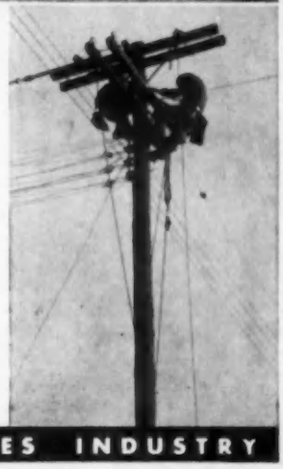

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LINE and DESK

RAY BLAIN, Editor

Q. A natural gas company is now piping our town for gas and we would be pleased to learn as to whether we should take any precautions to prevent the entrance of gas to our telephone manholes. Also how the presence of this harmful gas in our manholes may be detected?

A. Harmful gas in manholes is seldom caused by the leakage of a city gas system but is generally due to sewer gas. This gas often enters telephone manholes through drainage tiles which are not properly trapped and drain the telephone manholes into the sewers. However, an indicator may be purchased which will detect the presence of natural gas in a manhole. This indicator is in the form of a safety lamp and usually burns naptha or a high grade of gasoline. The indicator is equipped with a metal spark ignitor and a hinged mirror. The lamp is lowered into a manhole where gas is suspected while the operator watches the behavior of the flame in the mirror. When natural gas is found in a manhole it may ordinarily be removed by a suitable power driven blower.

Q. We plan to use some extra long rods for special grounding and would be pleased to have some information as to how such rods may be conveniently driven.

A. We suggest that you make use of a special sectional type rod now available which may be easily driven without special tools. These sectional rods are similar to the standard types of ground rods, except that they are roll threaded at each end and may be joined together with couplings. The following are the usual sizes of such rods although special lengths and diameters may be obtained if desired; ½" 5/8", ¾" and 10 foot length. The couplings for these sectional rods are made of strong bronze sleeves, threaded to fit the rod sections with which they are to be used. Steel driving bolts are used to take the blows of the driving hammer and avoid injury to the couplings. When driving deep sectional ground rods the coupling is first tightly screwed on the unpointed end of the first section of the rod and the driving bolt screwed into the top end of the first coupling. The first section is then driven to the ground line, the driving bolt removed from the coupling and the second section of the rod screwed into the coupling. Another coupling is then placed on the top end of the section, the driving bolt inserted as before and the driving continued. This operation may be repeated until the rod has reached the desired depth.

Q. We have a 50-pair aerial cable which must be replaced by a 100-pair. Will you please inform us how this change may be made without interrupting service?

A. The practice ordinarily followed is to ride the messenger, remove the rings and make temporary hangers about ten feet apart to support the 50-pair cable until the 100-pair is cut into service. The rings may be again attached to the messenger over a line to pull-in the new cable. When the old cable is removed the temporary hangers may be taken down. Another method often used is to leave the 50-pair cable in service and add a new 50-pair directly below it by the use of extra long rings placed directly between the regular cable rings. This arrangement makes a good job and often proves a real economy.

Q. I note that the majority of telephone companies when installing lightning arrestors connect the line to the fuse and the discharge blocks to the telephone. In my opinion better results may be obtained by connecting the discharge blocks direct to the line. Will you please give us your opinion in this connections?

A. Modern lightning arrestors are ordinarily equipped with both fuse and discharge blocks. When a heavy current discharges to ground the gap of the protector generally grounds solid and if there were not a fuse in the line to open the circuit the flow of this current for an extended period would most likely cause serious damage to the line. If the line was connected direct to the discharge blocks the fuse would not be in the line circuit and would serve no useful purpose on the protector. The capacity of most telephone protector type fuses is relatively high to prevent burn-outs on current flow from low potentials which would not ordinarily damage the line.

Q. What is the greatest amount of 400-pair, 22-gauge cable may ordinarily be obtained in one length of one reel?

A. Ordinarily we would say about 1200 feet. Naturally a greater length could probably be obtained on a special reel but as this cable weighs about 4½ lbs. per foot the weight of such a reel would make its handling rather difficult.

Q. What is a pressure testing plug as applied to a telephone cable?

A. These plugs are used in connection with gas pressure testing of cables and are usually classed as permanent or temporary. The permanent plugs are provided to subdivide a cable into permanent gas sections. Temporary plugs are used to facilitate maintenance and construction work and then removed. Special impregnating compound, paraffin or asphalt are often used to obstruct the flow of gas in a cable past a certain point.

Q. Will you advise us as to how racks to support sealed type, glass jar storage batteries, may be constructed?

A. We would suggest that you purchase a suitable rack from the suppliers of your storage battery. Either all-metal or metal and wood racks may now be purchased at a reasonable cost. When the all-metal racks are used, soft rubber strips provide a cushion between the metal and the glass jars. These racks may be procured in two or three tiers and make a most neat battery installation.

Q. We have a 50-pair cable which feeds the telephones located in the same building with our central office. Would it be better to terminate this cable on the terminal blocks of our main frame or the protectors?

A. When "B" type protection is used we would prefer to terminate the house cable on the protectors in the same manner as the outside cables. The house cables may be terminated on the terminal blocks of the horizontal side of the main frame though this makes a non-standard arrangement and complicates the running of jumpers. We believe that the slight increase in cost necessary to terminate house cable on the protectors is justified in view of the better job it makes possible.

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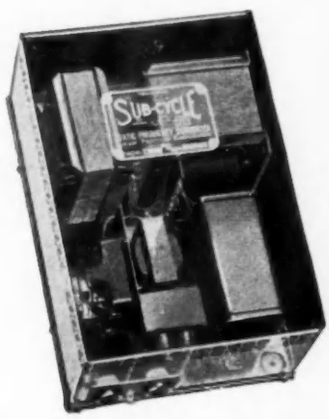

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Input	Output, 20 Watts
110 to 115 volts....60 cycles	75 to 90 volts....20 cycles
110 to 115 volts....50 cycles	75 to 90 volts....16⅔ cycles
220 volts....60 cycles	75 to 90 volts....20 cycles
220 volts....50 cycles	75 to 90 volts....16⅔ cycles

Reliable RU Unprotected Terminals

Capacity	Shipping Wt. Pounds Less Stub	With Stub
11-Pair	10½	15½
16-Pair	12¾	19
26-Pair	18¼	25

No. 6 Columbia Gray Label Dry Cells

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This dry cell is especially designed for telephone work and light drain service—2 or 3 for a standard magneto telephone. Voltage: 1½; Diameter: 2½ in.; Height: 6 in. Standard package: 25; Shipping Weight: 57 lbs.

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Leading experts state that a properly ventilated telephone booth brings added revenue to operating companies as a result of more calls being placed. The Bon-Air Telephone Booth Ventilator keeps air constantly in motion within the booth. The unit is mounted out of sight on the top of the booth at the rear. Fresh air is supplied to the interior of the booth through fibre tubes in conjunction with the ceiling fixture. The unit is quiet in operation and requires only a 25-watt input while operating.

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	17	Parallel	.109	32
BRIDLE WIRE	19	Twisted Pair	.098	22
	18	Twisted Pair	.109	31
	16	Twisted Pair	.125	42
POTHEAD WIRE	19	Twisted Pair	.093	20
INTERIOR WIRE	22	Twisted Pair	.055	10
	22	Triplex	.055	15
	19	Twisted Pair	.093	21
	19	Triplex	.093	32
	18	Twisted Pair	.109	26
JUMPER WIRE	22	Twisted Pair	.057	13
	20	Twisted Pair	.062	15

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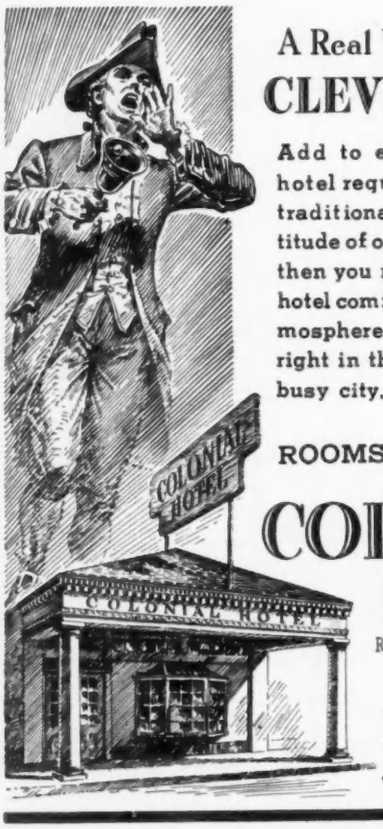

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"Tapping In" on Washington

(Continued from page 31)

or not it will assume regulatory authority over interstate interzone telephone rates in the case of extended exchange areas which cross state lines. The Commission has before it the question of the interstate interzones rates of the Southwestern Bell Telephone Co. in the extended exchange area of the two Kansas Cities in Kansas and Missouri.

The Southwestern Bell is to file its proposed findings in the case by Nov. 18 with both the FCC and the Missouri and Kansas utilities commissions. A brief hearing with all the major facts stipulated in an agreement between the FCC and the Southwestern Bell and the two state commissions was held in early October before Commisisoner Paul A. Walker. If the FCC decides that it should take jurisdiction over the interzone rates of interstate character, even though they exist in an extended exchange area, the telephone company will undoubtedly seek a court test on the question.

In the FCC hearing it was brought out that the extended exchange area was a natural growth of the telephone service to improve and stimulate the use of the telephone in the two adjacent Kansas Cities. The Southwestern Bell traffic official testified at the hearing explaining the distinction between short distance toll calls and the interzone traffic both in operating methods and in relations with the telephone users.

MISCELLANEOUS NOTES—FCC Commissioner Thad H. Brown is submitting his report on the Great Lakes radio communications survey to the Commission during the middle of November for final approval before it is transmitted to Congress. It is anticipated that the report will recommend radio telephony as the most adequate and practical means of marine radio communications on the Lakes—The Southern Bell presented its application to the FCC at a hearing on its proposed coastal harbor radiotelephone station at Madeira Beach, Fla., to serve Gulf of Mexico shipping—**The FCC is adopting the policy of caution in regard to requests from state commissions for cooperation in rate cases. The Federal commission majority is understood to take the attitude that the FCC cannot join in any substantial cooperative activity with the state agencies when the rate controversies do not involve interstate questions.** Under the new policy it is expected the FCC will curtail cooperation with the state commissions unless interstate telephone rates and questions are involved.

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- ✔ Short battery life
- ✔ Failure of ringing machines to operate correctly
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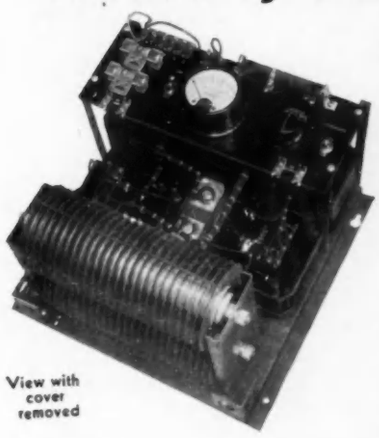
caused by Over Voltage or Over Charging



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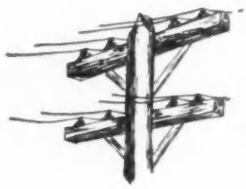


R. A. Clark, Jr.

TO the laymen of today engineering miracles are so commonplace that they are more or less expected, however to those of us who understand the technical problems which are encountered in developing new products and processes an unusual development such as I witnessed a few days ago merits acclaim the same as did the inventions of Bell and Edison years ago. Out of the laboratories of the Bell System has come a development which to us in the telephone field is most startling and amazing. This device termed the Vocoder is a first cousin to the Voder which has been demonstrated for several months. The invention of the Voder and the Vocoder represent the results of a long and persistent study of the fundamentals of speech communication and may lead in the future to radical changes in our present methods of communication. While perhaps these devices may not develop as much as other inventions still they might open up many new and interesting fields.

The Voder, of which many of you have undoubtedly heard mention, has been demonstrated at both Worlds Fairs this year; it is a device by which speech can be created by manipulating a combination of keys such as on a pipe organ or piano. The Vocoder goes one step further. It takes the spoken voice, analyzes it and then uses the results of this analysis to recreate speech.

The practical applications of the device are as yet more or less unexplored, however, looking into the future there are many possibilities. For example, from this system may come a new method of writing the English language. It would be possible to write this language automatically by using the spoken word. Likewise, the written communication could be decoded and converted again to speech. This scheme may be one of the more distant applications. More immediate are the use of the apparatus to provide secret communication. There also may be numerous applications in the radio broadcast and moving picture field as many weird effects can be produced.

For example, the low pitched voice of a man can be changed to a woman's high soprano and vice-versa. Another interesting phenomena is the super-position of voice on musical notes, chimes and other sounds. For example, bells can be made to talk, words may be added to the notes of a violin or organ. These phenomena are startling to say the least and will undoubtedly find applications in the moving picture and radio field.

While the apparatus itself is complicated the basic principles are relatively simple and readily understood. Fig. 1 shows a schematic of the system. On the left is a conventional microphone which feeds into a speech analyzer. The speech analyzer measures the volume of the speech by frequency bands there being about thirty groups into which the speech is divided, each group is measured as to energy. There are two basic sources of energy which the speech analyzer controls. One is a low frequency buzz the pitch of which can be controlled and which furnishes the basic tone of the recreated speech. The other is a high frequency hiss. This provides the quality component of the speech. Without the latter it is difficult to distinguish certain characteristic sounds. Without the low frequency component the recreated speech sounds much like a whisper and can be fairly well understood. The two sources of energy feed into a control which actuates the speech amplifier. This control permits the correct proportion of each energy source to pass into the amplifier and thence the loud speaker as determinded by the speech analyzer.

The Voder is quite similar to the Vocoder explained above except that the control is actuated by keys instead of the speech analyzer. Considerable skill is required to manipulate the control; however, as many of you know by listening to the demonstrations, the results are surprisingly good. For an interesting evening of scientific entertainment either a demonstration of the Voder or Vocoder is highly recommended.

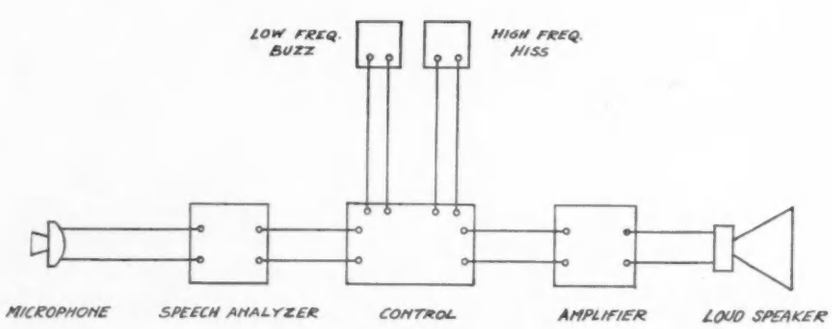


Fig. 1—Schematic of Vocoder.

Service Cut—To Bookies

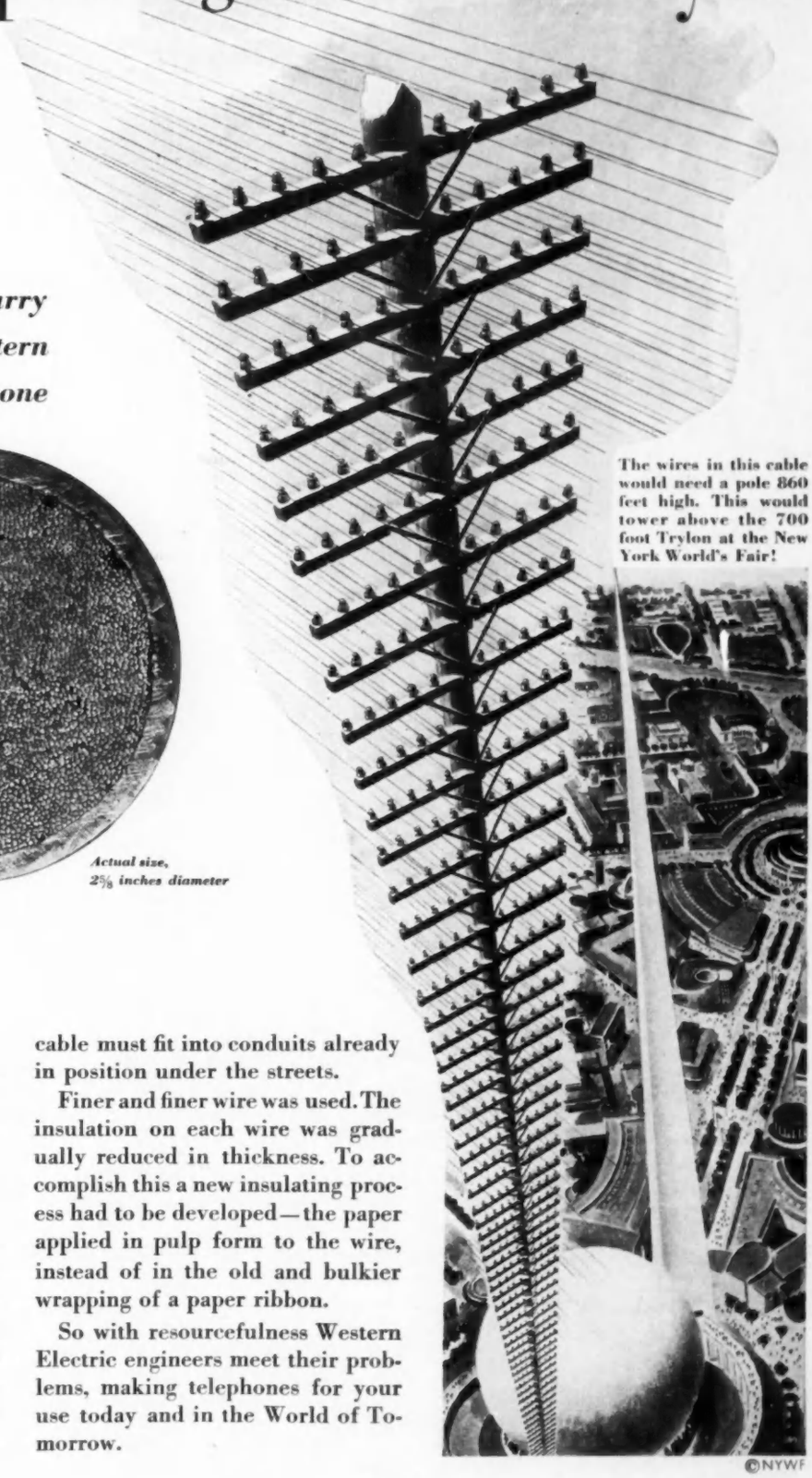
Following action of a Federal district judge, sitting in Chicago, who denied an injunction restraining the Illinois Bell from discontinuing service to the Nationwide News Service and several individuals on Nov. 8, the service to those named above was discontinued on November 9.

This action was taken after an exchange of letters between representatives of the government and telephone company officials because of the contention by the

A telephone pole higher than the Trylon

. . . would be needed to carry the 4,242 wires that Western Electric packs in a telephone cable this size—

Actual size, 2⅝ inches diameter



The wires in this cable would need a pole 860 feet high. This would tower above the 700 foot Trylon at the New York World's Fair!

©NYWF

Either fantastically high poles would be needed—or many people who now have telephones would have to go without. Streets couldn't hold enough poles for the telephone requirements of a modern city.

To handle the demand for service Western Electric's Engineers in collaboration with Bell Telephone Laboratories' scientists have sought and found ways to make cable containing more and more wires, *without increasing the cable's diameter.* The need for compactness is because new cable must fit into conduits already in position under the streets.

Finer and finer wire was used. The insulation on each wire was gradually reduced in thickness. To accomplish this a new insulating process had to be developed—the paper applied in pulp form to the wire, instead of in the old and bulkier wrapping of a paper ribbon.

So with resourcefulness Western Electric engineers meet their problems, making telephones for your use today and in the World of Tomorrow.

Western Electric *. . . made your* **BELL TELEPHONE**

How to be sure your climbers are

SAFE

With climbers as with other equipment for the lineman there can be no compromise with safety. Kleins are the result of 82 years' experience. Special steels—individual tempering and testing—rigid supervision—assure uniform performance and maximum satisfaction, safety, and over-all economy.

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- **Klein's New Lightweight Climbers**
- **Write for the Klein Pocket Tool Guide**

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3200 Belmont Avenue, Chicago, Illinois

government that service was being furnished to unlawful enterprises. It is alleged that bookmakers who operate contrary to law make extensive use of telephone service therefore the government sent joint letters to the Western Union, the A. T. & T. and the Illinois Bell suggesting the curtailment of service. The original date of the cut off was postponed until the action mentioned in the first paragraph occurred.

Central Missouri Agrees to Bargaining

The National Labor Relations Board announced during October that the Central Missouri Telephone Co., Warrensburg, Mo., had agreed to bargain upon request with the International Brotherhood of Electrical Workers (A.F.L.)

The company also agreed and the board ordered it to stop interfering with employes' self-organization and from discouraging membership in the A. F. L. union. The board dismissed the complaint that the company had discriminated against Robert Adams, Max H. Atkinson and Orville E. Selix.

New Ship-Shore Station Is O.K.'d

The federal communications commission has issued a permit for Thorne Donnelley to construct a new ship to shore radio-telephone station at Mackinac Island, Mich. Donnelley has been operating a similar station, WAY, at Lake Bluff since June, 1938.

The new station will have a power of 400 watts and has been assigned a channel of 2,550 kilocycles. It will serve parts of Lakes Michigan, Superior, and Huron. Construction will start at once. The cost is estimated at $25,000.

Under a new FCC ruling, ships operating on 2,550 kilocycles are required to communicate with the nearest coastal station wherever possible, and this is expected to result in a considerable volume of business for the new station. Rates are $1 for three minutes on a station to station call, and 25 cents more for a person to person call.

Phone Service for the Deaf

An order to set up telephone apparatus for use of deaf persons sounded like a real poser, but Ohio Bell Telephone Co. engineers took the assignment in stride when service was supplied to the Ohio Home for Aged and Infirm Deaf at Westerville, Ohio.

Two voice amplifiers in tandem were placed on receivers in addition to a bone conduction receiver.

Listeners at the home couldn't distinguish words, however, until an engineer had a happy idea.

C. H. Hoover, the engineer, suggested that a newspaper be read to deaf listeners by telephone while they read simultaneously the same items. Residents quickly adapted themselves to carrying on conversation via telephone after instruction in that manner.

South Dakota Association Selects H. R. Burr

Holding their 33rd annual convention at Mitchell, S. D., the South Dakota Telephone Association elected H. R. Burr, Faulkton, as president; selected the retiring president R. W. Aszmus, as senior vice president. F. E. Wheeler, Scotland, as junior vice president, and C. E. Adams, Groton, as secretary-treasurer. A nice attendance of the smaller companies was noticed with a total registration larger than in the past.

Pioneers Offer Trip to Convention

That the Pioneer Association shall pay for the transportation, hotel room, and meals of Independent Pioneers attending the 1940 Independent telephone convention at Chicago, who, during the period between the 1939 and 1940 convention dates shall obtain new applications for Pioneer memberships, accompanied by advance payments as folows:

Residing within 1000 miles of Chicago, 25 applications.

Residing more than 1000 miles and less than 1200 miles from Chicago, 30 applications.

Residing more than 1200 and less than 2500 miles from Chicago, 50 applications.

Provided the above shall apply only to Pioneers working in an individual capacity, and not to company Executives who desire to show special co-operation with the Pioneer Association by making block payments for groups of employees. Write to J. K. Johnston, 632 Lemcke Bldg., Indianapolis, for necessary forms, advertising, etc.

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are preferred for their flexibility, longer wear and trouble-free service.

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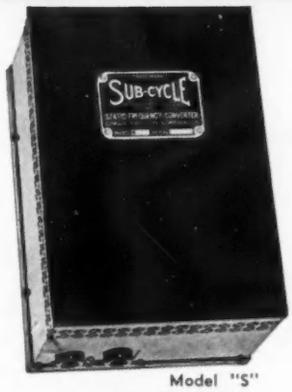
1751 N. WESTERN AVE., CHICAGO, ILLINOIS, U. S. A.
"IN BUSINESS SINCE 1904"

SUB-CYCLE
The MASTER Ringing Converter



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PRICE $45.00

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ALSO PULSATORS
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Export Agents: International Standard Electric Corp., New York

For the Business Office — as well as the Toll Board

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Dating and timing your mail is as important as any other office practice.

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For over 25 years Dorson has been making timing devices. for $17.50 and the Tolltimer The Dorson Time Stamps sells for $22.50.

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Telephone companies have been using time stamps in their front office for many years.

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Write for illustrated literature—TODAY!

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CHICAGO ILLINOIS

New Nicopress Tool Introduced

31-D Nicopress Tool

The National Telephone Supply Company, after many months of research and test have just placed on the market a new Nicopress Tool. This tool is especially designed for the splicing of "85" — "135" — and "BB" 12 BWG Galvanized Steel Wire.

In planning this 31-D Nicopress Tool, National engineers have laid special stress on the design of the leverage system, to assure the greatest possible ease of operation of the tool by the lineman. With comparatively light pressure on the handles the required force, to make tight, strong splices is easily obtained. This force is about 80 times the handle pressure.

This new Nicopress tool is very compact and light, it is only 11" long and weighs but 2 pounds. It is very convenient for the lineman to carry either with or without holster. (Special holsters are made for this tool.)

The uniquely designed, man-sized, "palm-fitting" handles assure ease of handling by the lineman when working either on the ground or in the air.

Nicopress Sleeves for use with this tool in splicing Galvanized Steel Wire are available for all strength 12 BWG Galvanized Steel Wire ("85"—"135"—and "BB").

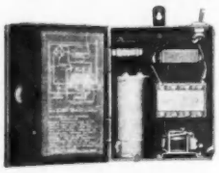
"National's Executives and Engineers feel that with the development of this new Nicopress tool they have made available for those using 12 BWG Steel Conductors an exceptionally simple, effective and economic method of splicing this type conductor. They claim that with the use of the 31-D Tool and Nicopress splices you can get high strength splices on high strength steel wire. Literature and Price List are ready for you—can be secured by addressing this publication or writing directly to the National Telephone Supply Company, 5100 Superior Avenue, Cleveland, Ohio.

Connecticut Company Sells 21,000 Field Telephones

According to newspaper reports, The Connecticut Telephone & Electric Corp., Meriden, Connecticut, has been awarded a contract from the War Department for 21,000 field telephones costing $526,-365.

The report further stated that this contract is a part of the national defense expansion program authorized at the first session of the present Congress, and that further smaller contracts would more than likely be received by the same company.

New Electrox Rectifier Announced



A new compactly built and highly efficient unit for supplying a constant source of humless D. C. to magneto switchboard operator's circuit is offered in the type PA-05004 ELECTROX Rectifier made by the Schauer Machine Company.

Consuming less than 3 watts and therefore operating at a cost of but a few cents a month the low cost type PA-05004 ELECTROX Rectifier will give many years of trouble free service, the company claims.

Complete with attachment cord and plug, a tapped transformer for varying the D. C. output to meet the requirements of the telephone circuit being supplied, ample choke and condenser filtering, and a rectifying element of the dry copper oxide type. The PA-05004 ELECTROX Rectifier has been designed to give sufficient power for the operation of one or two transmitters. All parts are enclosed in a steel case size 6"x8"x3½", arranged for wall mounting and finished in an attractive black Jack Frost lacquer enamel.

Write for circular No. 373 for particulars regarding this new product and others for telephone service. Address the Schauer Machine Co., 2060 Reading Road, Cincinnati, Ohio.

Add to your profits by leasing or selling

Loud Speaking Intercommunication Systems

Televox • Instantphone • Duo-Vox

for every application in industry and home use

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BUILDING STILL BIGGER FOR STILL BIGGER BUSINESS
Shots of the new buildings now being erected at Strowger Works, Liverpool, to increase capacity to manufacture:
Strowger Automatic Telephones for Public and Private use; A.T.M. Street Fire Alarm and Ambulance Call Apparatus; Electro-matic Vehicle Actuated
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Rythmatic Control for Street Lamps and National Defence Schemes; Telephone Transmission Equipment; Etc., etc.
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Santa Barbara, California, Added to General Telephone System

C. F. Mason, President. Associated Telephone Company, Ltd.

Directors, Officers and Executives of the Santa Barbara Telephone Company.

ACQUISITION by General Telephone Corporation of the control of Santa Barbara Telephone Company was announced on October 2, 1939 by C. F. Mason, President of Associated Telephone Company, Ltd. and manager of all properties of the General Telephone System located west of the Mississippi.

In taking over the properties, General Telephone Corporation acquires a company which serves, through its nine central offices and its own toll lines, the entire County of Santa Barbara and a small area extending into San Luis Obispo County to the north. Seven of the central offices are dial operated and serve 85% of the 18,600 stations in fifteen communities and their surrounding territory. Total investment in plant and equipment is approximately three and a half million dollars.

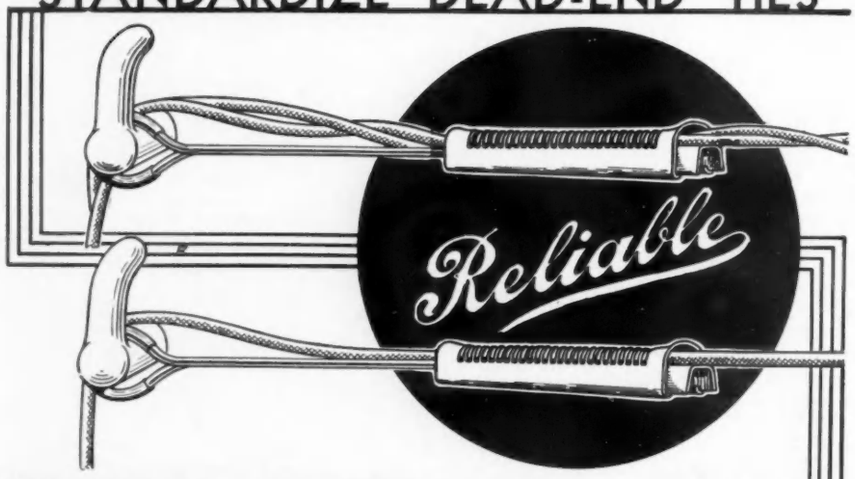
The company's main building and headquarters, located at West Canon Perdido and Chapala Streets in Santa Barbara, is of fireproof steel and concrete construction and was carefully planned for the convenience of patrons and to afford comfortable and efficient operating quarters for all departments. Foundations and supporting columns were designed ultimately to carry a third floor when growth of the city's population brings increased demand for telephone service.

In a city of beautiful homes and business structures which conform in general to the Spanish type of architecture, the headquarters building stands as one of the most beautiful, resembling closely the City Hall of Seville which was built at the height of the Spanish renaissance. The arched windows, wrought iron balconies, ornamental balustrade and richly designed portals so characteristic of medieval Spain are faithfully reproduced, and terra cotta medallions commemorative of early California history are placed above the entrances on two sides of the building.

About 150 persons are on the payrolls of the Santa Barbara company, and all who could be spared from their duties were guests at a luncheon on October 2nd at which R. E. Easton, former President of the company, notified them of the transfer of properties. Mr. Mason said, in his address to the employees, "I have known many of you for a long time. Some of you previously have worked for Associated Telephone Company, Ltd. or its predecessors, and I am happy to welcome all of you into our System.

"So far as you are concerned as em-

"STANDARDIZE DEAD-END TIES"



DROP WIRE CLAMPS

- The type "P" drop wire clamp is an ideal device for attaching No. 17 B & S twisted pair of parallel drop wires to poles and buildings. It prolongs the life of the drop wire, permits free swinging at the tie, places all of the wear on the hardware and eliminates the sharp bends necessary with other methods.

This clamp is easily and quickly installed, making a very neat installation. Slack in drop wires can be taken up quickly without leaving any weak spots on the wire. Write for samples.

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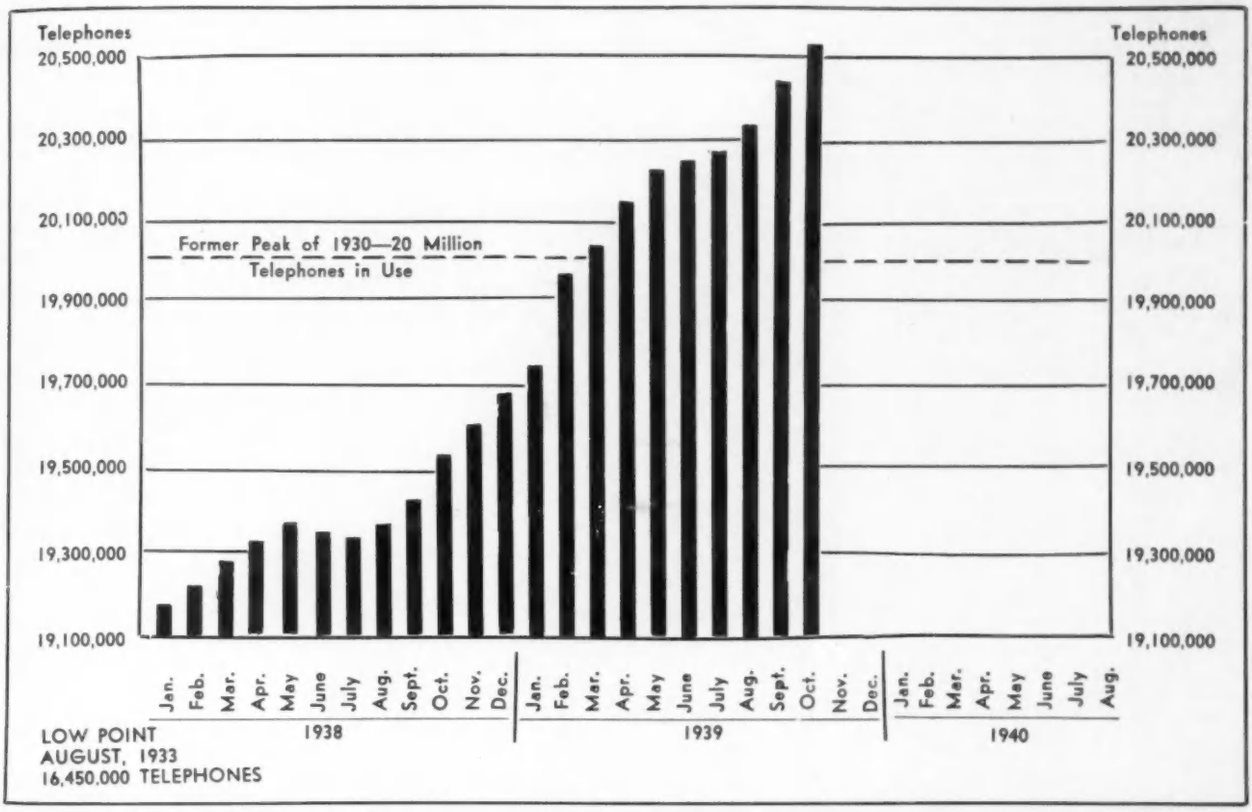
Monthly Telephone Station Barometer



Unbreakable Thermometer *plus*

CONTROLLED FLAME FURNACE = HEAT CONTROL MASTERED

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We have found after considerable experimentation that materials being heated can be MAINTAINED at correct temperatures through the use of a Dillon Temperometer in conjunction with a Controlled Flame Furnace. We are offering the Unique Controlled Flame Furnace along with our Temperometer, the Temperometer being used in checking the temperature of a material being heated to a specified temperature, the Flame Controlled Furnace thereupon maintaining that temperature.

Dillon Temperometer. Graduated from 150 to 1000 degrees F. Dial arrows point to correct temperatures for different materials. Centigrade reading if wanted..... **$ 6.00**

Unique Controlled Flame Furnace, Gasoline or Kerosene, New low price..... **$12.00**

Prices F.O.B. Chicago

Due to the scientific value of the Dillon Unbreakable Temperometer in determining temperatures of materials being heated, it has been adapted as standard equipment by the larger companies in the telephone and utility fields.

Order through your jobber or direct to

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build SECURITY into your lines

with CHANCE construction materials

1. Chance Guy Fixtures make dependable, easily applied guy attachments. The Chance Thimbleye on all Chance fixtures gives extra protection to guy strand and aids slack pulling.
2. There's a Chance anchor for every job. Steel expanding, Wej-Lock malleable expanding, Never Creep malleable plates, Never Creep cast plates, Cone, Rock, and Screw anchors of all types. A complete range of sizes.
3. Chance Anchor Rods give you 1, 2, or 3 strand attachments. Thimbleye, Twineye, or Tripleye — threaded or Never Creep.
4. Chance Cable Rings are No-tangle packed. They hold without slipping or jumping off due to spiral gripping hook and shoulder hook. Smooth curved surface minimizes cutting.
5. Chance Pulley Blocks are light in weight and powerful in pull. No burden to carry on the job. Easy to operate.
6. Chance Reversible Point Pike Pole prevents dangerous projections on the truck. Point is freed by button release. Points are renewable at little cost. Spiral point holds tight to the pole.

Consult your Chance catalog for complete information about Chance construction tools.

A·B·CHANCE CO. CENTRALIA MISSOURI

Main building and headquarters of Santa Barbara Telephone Company.

ployees, I feel you will appreciate the advantage of being connected with a larger system. I have found, and I believe my assistants will testify, that as our company has grown, more opportunities for advancement or for transfer to more desirable work have developed. With very few exceptions, in the Associated Company all of the officers department heads and supervisors are people who have come from the employees' ranks and have grown with the organization. The larger organization also can generally offer you better facilities for training and for building up valuable experience."

It was in 1882 that telephone service first was offered in Santa Barbara. In that year the Pacific States Telephone Company established a central office in a drug store for twelve subscribers. In 1904 the Home Telephone Company of Santa Barbara was organized, and extended its service in 1907 to include the entire area in Santa Barbara County.

THE Santa Barbara Company commenced operations on December 1, 1916 when it acquired the properties of The Pacific Telephone and Telegraph Company, Home Telephone and Telegraph Company of Santa Barbara, and Home Telephone and Telegraph Company of Santa Barbara County. A period of unification followed during which central offices and facilities were consolidated and all duplicate plant was removed. In 1928 the new building was erected in Santa Barbara and automatic equipment was installed.

The Board of Directors of the Santa Barbara Telephone Company consists of C. F. Mason, Eliot H. Cheadle and Harlan W. Holmwood of Santa Monica, G. E. Jones of Los Angeles, A. L. Chickering, Jr. of San Francisco and R. E. Easton, Chairman and D. A. Sattler of Santa Barbara. Officers are C. F. Mason, President, Eliot H. Cheadle and D. A. Sattler, Vice Presidents, Harlan W. Holmwood, Secretary-Treasurer and Marion Mountain, Assistant Secretary-Assistant Treasurer.

Although its operating headquarters have been transferred to Santa Monica, the Santa Barbara company will continue to operate as a separate unit.

R. E. Easton, new Chairman of the Board, was president and treasurer.

D. A. Sattler, vice president and director.

$200,000 Improvements for Chillicothe, Ohio

Announcement has been made by the Chillicothe (Ohio) Telephone Company that Chillicothe's 6000 telephones will be converted to automatic operation by next August. Orders have been placed with American Automatic Electric Sales Company for the equipment, which will be manufactured by Automatic Electric Company.

Col. David C. McKell, president of the Chillicothe company, announced also that the installation of automatic switching equipment would be part of a $200,000 improvement program. Work has already begun on remodeling of part of the present company headquarters. In addition, a new 28,000 cubic foot structure is to be erected to house the new equipment.

As She Is Heard

A lady from one of the foreign pavilions at the New York World's Fair, approached a girl in charge of the hearing tests at the Bell System exhibit and asked hesitantly: "Would you be kind enough to take a hearing test for me? You see, I don't understand English very well."

With Stromberg-Carlson at the Convention

Dr. Ray H. Manson, Stromberg-Carlson's Vice-president and Chief Engineer, points out features of the new Stromberg-Carlson all-relay C.A.X. system introduced at the convention, to General Sales Manager Lloyd Spencer.

Officials, engineers, and salesmen of all branches of the Stromberg-Calrson Company, brought together from every part of the country by the convention, held an enthusiastic sales meeting during the Sunday preceding regular Convention activities.

At that time they previewed the new Stromberg-Carlson all-relay C.A.X. Sys-

(NEXT PAGE PLEASE)

New Product

An "industrial stethoscope" for the use of acoustic engineers engaged in the diagnosis and checking of running machinery has been announced by Electrical Research Products Inc. Just as a doctor listens to the heart beats of his patient and then charts his condition, so the Recording Frequency Analyzer (as the new device is called) discloses the "sound" condition of motors undergoing test, and records the result on a graph automatically.

The equipment employs frequency analysis by the "sweep" method, using a small drive motor to actuate the frequency dial which sweeps the whole range of frequencies from 30 to 10,000 cycles per second. With this motor is synchronized another motor driving a band of graph paper on which a stylus traces the sound level at each frequency passed.

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Of Top Quality by **UNIQUE**

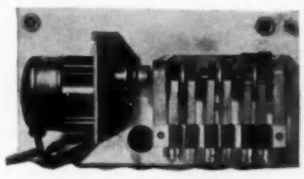
- FURNACES
- SOLDER POTS
- BLOW TORCHES
- WIPING CLOTHS
- BALANCED LADLES
- SOLDER IRON HANDLES
- POLE BLEEDING TORCHES
- FOLDING SAFETY SHIELDS

Protect Public, Splicer, and Furnace. No. 50 C Shield shown here. Of 22 Ga. galvanized steel. Reinforced edges. 23"x17"x 17". No. 50 — four-sided with grate. No. 50 A —same without grate.

Your Jobber Has These Tools

UNIQUE MANUFACTURING CO., INC.
221 W. Walton St. — Chicago, Ill.

A NEW MOTOR DRIVEN INTERRUPTER



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NO BRUSHES or SLIP RINGS
110 VOLT, 60 CYCLE MOTOR DRIVE for COMMERCIAL POWER
80 VOLT, 20 CYCLE MOTOR DRIVE for RINGING POWER
A PRECISION INTERRUPTER for TELEPHONE EXCHANGES

Write for Bulletin 1310-02

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125 Amory St. BOSTON, MASS. — *Motor Specialists* — 6161 So. State St. CHICAGO, ILL.

Crapo
HIGH-TENSILE
LOW-RESISTANCE
TELEPHONE WIRE

Crapo HTL-85
INDIANA STEEL & WIRE CO.
MUNCIE, INDIANA, U.S.A.

For Long Spans

Crapo HTL-135
INDIANA STEEL & WIRE CO.
MUNCIE, INDIANA, U.S.A.

For Extra Long Spans

LOWER FIRST COSTS
LESS MAINTENANCE

Construction costs are reduced to a new low level, maintenance expense is minimized, wherever *Crapo* HTL-85 and *Crapo* HTL-135 High-tensile, Low-resistance Line Wires are used. These revolutionary wires, with their superior strength, make possible rural lines with span lengths one and one-half to two and one-half times greater than were practical heretofore.

Crapo HTL-85 permits spans to 225 feet in heavy, 325 feet in medium, and 375 feet in light loading districts; provides stronger spans on existing pole structures.

Crapo HTL-135 makes possible spans of from 350 feet in heavy to 500 feet in light loading districts. Both wires possess superior telephonic transmission qualities.

Write for complete technical data and construction practice information!

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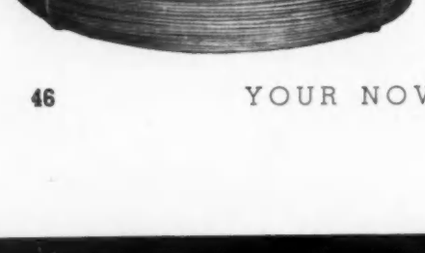
Manufacturers of
Crapo Galvanized Telephone Wire
Steel Strand, Tie Wire,
Construction Wire.



tem and the two new P.B.X. Boards, one a cordless type, Stromberg-Carlson's most recent contributions to telephony which were introduced at the convention.

In the midst of their product display stood a huge mechanical book whose pages duplicated those of a recent publication, **The Romance of Stromberg-Carlson Handsets.** Slowly, automatically, the pages turned, revealing how a transmitter of startling efficiency was developed; how it was tested by the "Artificial Mouth." How an equally efficient receiver was developed; how it was tested by the "Artificial Ear." Then the pages told the story of Stromberg-Carlson's radio experience being responsible for an induction coil, capacitator, and ringer, each highly efficient but of remarkable compactness—making possible the streamlined Stromberg-Carlson No. 1212 Self Contained Handset.

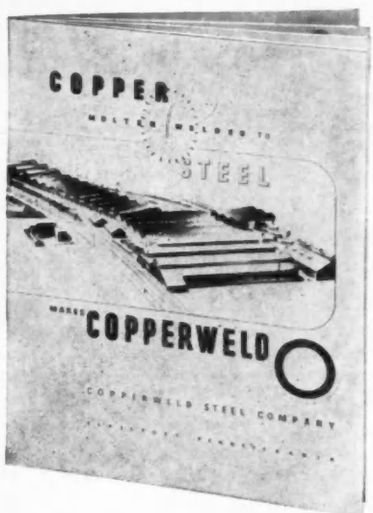
The modern, streamlined beauty of Stromberg-Carlson's new P.B.X. board caught the eye of convention delegates. Here F. C. Young, Stromberg-Carlson Manager of Engineering, demonstrates its operation to J. I. Kennedy of Freeport, Ill.

Taking another look at Stromberg-Carlson's "Mechanical Book" which took a prominent spot in their company's display are E. A. Reinke, Commercial Superintendent and E. A. Hanover, Vice-president in Charge of Production. Pages turned automatically, telling the "Romance of Stromberg-Carlson Handsets."

Billington Resigns From Kellogg

H. E. Billington, executive vice president of the Kellogg Switchboard & Supply Co., submitted his resignation October 31 to president James G. Kellogg, to become effective immediately. Starting as sales manager in 1927, Mr. Billington served in succession as general sales manager, vice president in charge of sales, and executive vice president.

Educational Booklet Available from Copperweld



Just off the press is an eight page booklet, completely illustrated in color, describing the unique process of molten-welding copper to steel in the manufacture of Copperweld. The booklet describes the rolling, drawing, and stranding of Copperweld wire and strand, and also describes the manufacture of Copperweld ground rods.

Write to the Advertising Department of Copperweld Steel Company, Glassport, Pa., for a free copy.

New Rates Granted for Wage-Hour Increase

Action of the Oklahoma Corporation Commission in granting a rate increase to the Sulphur (Okla.) Telephone Company was the first granted because of the wage and hours statute in that state. Basing his application on higher operating costs of approximately $82 per month mostly from increases demanded by the Wage Hour Law, the application to raise to a net billing increase of $70 per month was passed October 25. 50c increases on individual-business line and also on party line business stations were granted.

Chas. H. Klein Makes Inspection Tour

Mr. Charles H. Klein, Chief Engineer and Head of the Research Laboratories of The National Telephone Supply Company has been on an extended inspection trip to the West Coast. Mr. Klein visited and contacted the telephone and power companies between Cleveland and the Coast. Mr. Klein has had a long and broad experience in the telephone field and is extremely well informed in telephone line construction problems. Mr. Klein's trip was undertaken in the line of research especially for the splicing of communication lines.

Appointed Assistant to President of Graybar Electric Company

On November 1st, Alfred H. Nicoll, San Francisco District Manager of the Graybar Electric Company since 1932, became Assistant to the President, Frank A. Ketcham, with headquarters in New York. Mr. Nicoll has been associated with the Company since 1911, when he came to the San Francisco house as Sales Record Clerk. Within a year, he became Assistant to the Power Apparatus Specialist.

Be Sure to Study Over the Newest

No. 51 Suttle Salesman

which you will receive in a few days

●

See especially announcement of

NEW UNDERGROUND RUBBER COVERED WIRE

●

SUTTLE

EQUIPMENT CO.

LAWRENCEVILLE, ILLINOIS

PROFESSIONAL LINEMAN PATTERN

Lineman's Favorite

58-R—8½"—$3.25

57-R—7"—$2.50 56-R—6"—$2.00

It's easy to prove the "Better-performance - longer - life" claim made for Vacuum Grip Pliers. Our 30-DAY TRIAL OFFER enables you to make running tests at our risk. Write for particulars—TODAY!

THAT SHADOW OF DOUBT!

DOUBT! An ominous word! Sooner or later it must cast its shadow on every purchasing agent who has seen Vacuum Grip Pliers advertised month after month . . . without doing anything about it.

Unless he has proven the claims of superiority made for these super-pliers how can he be sure that he has been getting the fullest value for his money in "pliers efficiency" and "pliers economy"?

Has he overlooked his company's interests in failing to ascertain the complete facts about Vacuum Grip Pliers by a series of tests which the manufacturers invite him to make . . . without commitment or obligation?

Made by the **FORGED STEEL PRODUCTS CO.** Newport, Pa. — and made **RIGHT!**

Vacuum Grip Pliers

OVER A MILLION AND A QUARTER IN USE

The Clearing House

For the convenience of readers of Telephone Engineer

ELECTROX
POWER SUPPLY RECTIFIERS
FOR TELEPHONE SERVICE

There's an ELECTROX for Every Telephone need:
ELECTROX Battery Eliminators with or without power-off relays for magneto operator's sets.
ELECTROX Battery Eliminators with constant voltage output for PAx and PBX with or without sub-cycle ringer.
ELECTROX Battery Chargers for trickle charging telephone batteries.
ELECTROX AUTOMATIC Battery Chargers for exchange batteries.
Write for Bulletin No. 373.

SCHAUER MACHINE COMPANY
2064 Reading Road, Cincinnati, Ohio

LOOMIS ADVERTISING CO.
TELEPHONE DIRECTORY ADVERTISING

A SALES ORGANIZATION
Exclusively....

That Has Never Failed to Produce More Net Revenue for Telephone Companies Served, All Costs Considered.

IF INTERESTED in more net telephone directory revenue write or call at our expense.

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Telephone Engineers
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CHICAGO

J. W. WOPAT
CONSULTING ENGINEER
Telephone Engineering — Construction Supervision — Appraisals — Financial — Rate Investigations
1510 Lincoln Bank Tower
Fort Wayne, Indiana

New "Toll Timer" Shown at Convention

Preview of the new "Toll Timer" of the Dorson Corporation, 605 Washington Blvd., Chicago, was shown at the recent National Convention. Unlike the original "Toll Timer" the new model is electrically operated giving in a straight line the reading, including seconds, for the start of conversation at the touch of a button, and at the finish of the call the time impression is printed directly under the starting time. This allows a quick computation on the face of the toll ticket.

Engineered to be placed in the switchboard in a very compact, small size, the new "Toll Timer" received much attention during the convention. Economical cost plus full guarantees are featured by the company who have been making time recording devices for the past quarter century.

"Safe-Line" Wire Rope Clamp

The "SAFE-LINE" WIRE ROPE CLAMP, manufactured and marketed by the National Production Company of Detroit,, Michigan, has streamline design, double holding power, ease of assembly, safety for employees —and the cost is low.

The inner surface that grips the wire rope, is double spiral splined to fit each strand and wire of the rope, thus making a perfect and secure grip on each section of each wire and strand. The gripping halves of the clamp are held tightly to the rope by taper threaded nuts. The "SAFE-LINE" Clamp is made of high tensile strength steel and is guaranteed to outpull any wire rope made. Stock sizes are for ropes ⅛" to ¾". It leaves no sharp wire ends nor projections to injure men who work with it. A bulletin is available by addressing the editor.

Telephone Directories

Telephone Directory ADVERTISING
Write or telephone for proposition
L.M.BERRY & CO.
Call L.D. 16, Telephone Bldg., Dayton, O.

Poles

Carney
CEDAR POLES
Plain or Butt Treated
B. J. CARNEY & CO.
100 No. 7th St. Minneapolis

Finished Cedar Poles
VALENTINE CLARK CORPORATION
St. Paul, Minn.

THIS LITTLE GIRL WILL HAVE A HAPPY CHRISTMAS but

Tuberculosis is still the greatest killer of youth . . . and takes *fifty per cent more girls* than boys between the ages of 15 and 25!

Two modern aids that help the physician detect tuberculosis in its earliest, *curable* stage are the tuberculin test and the chest X-ray.

Your purchases of Christmas Seals make it possible, not only to teach people that tuberculosis is preventable and curable, but to look for early stages of this dread disease among children who *seem to be* in good health.

So from now 'til Christmas, mail no letter—send no package—unless it is decorated with the Christmas symbol that saves lives!

The National, State and Local Tuberculosis Associations in the United States

1939 **BUY CHRISTMAS SEALS**

The Clearing House

For the convenience of readers of Telephone Engineer

WHEN YOU NEED CORDS BUY QUALITY CORDS

Commercial Cords are high Quality cords, because they are made using the Best materials and with expert workmanship.

Send for samples and convince yourself that their Quality and prices are right.

"QUALITY CORDS"

Commercial Cord
AND SUPPLY COMPANY
CLIFTON SPRINGS, N. Y.

RECONSTRUCTED EQUIPMENT

Western Elec. No. 20 desk sets with No. 315 3-bar 1000-1600 ohm 2500 ohm ringer inside connection signal set $10.00—4-bar $10.75—5-bar @ $11.50

Western Elec. No. 46 Central Battery Ind. Coils @ ..... .50

Western Elec. No. 20 Central Battery Ind. Coils @ ..... .35

Stromberg Carlson No. 1179 All Bakelite Hand set with 3-bar 1000-1600 or 2500 ohm ringer inside connection signal set $14.25—4-bar $14.50—5-bar 15.50

Kellogg No. 115 Desk type Grabaphones with 3 Cond. cord wired for use with any standard 3 Cond. connection signal set @ 4.50

Kellogg No. 115 Grabaphone with 3-bar 1000-1600 or 2500 ohm ringer signal set $10.00—4-bar $10.50—5-bar @ 11.50

Gray No. 11 3 slot wall type paystations for 5 lo and 25c coins @ 6.50

Western Elec. No. 38 latest type 2500 ohm ringers with 3 inch gongs @ 2.25

Telering ringing machine operates off 110 Volts A. C. Light Ckt. @ 20.00

Stromberg Carlson, Leich or Monarch Local Battery Transmitters with back and new mouthpieces @ ..... .90

Kellogg 8 line cordless P. B. X. board equipped with 8 local line visual signal and two ring down trunks, complete with desk set Opr. set @ 60.00

Western Elec. No. 21D. 2 M. F. Condensers @ ..... .35

Stromberg Carlson No. 896 3-bar 1000-1600 or 2500 ohm ringer compacts $8.75—4-bar $9.25—5-bar @ 9.75

REBUILT ELECTRIC EQUIPMENT CO.
Not Inc.
1934 WEST 21ST ST., PILSEN STATION
CHICAGO, ILL.

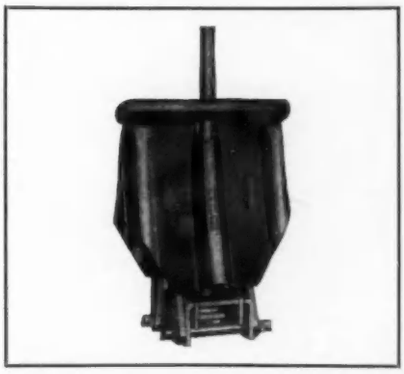
Contest Winner

The Nickel Plated blow torch which Unique Mfg. Co., Inc., raffled off at the recent Independent Telephone Convention was won by Mr. R. E. Brookbank of the Pendleton (Indiana) Telephone Company. Unique says "Thank you" to all the Telephone people who showed so much interest in this little torch and in their other cable splicing tools.

(Consolation to losers: Unique has a plentiful supply of these little torches —$3.75 each).

Hubbard Introduces New Anchor

Pictured is the new expanding anchor just announced by Hubbard & Co., Pittsburgh, Penn. It was designed by that company and comes in large,



medium and small sizes, each painted a different color. This new anchor is described graphically in Vol. 16-No. 1-2 of the Hubbard Linebuilder and is available to readers. It gives specific information including tests, expanded area, etc. Write the company direct or the editor of TELEPHONE ENGINEER.

Specialists in Rebuilding and Repairing

TRANSMITTERS

Western Electric grounded transmitters rebuilt and made metallic ..... @$ .80

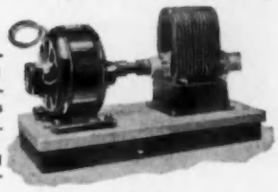
Metallic type of transmitters complete, rebuilt, each ..... .50

Auto-Elec. No. 21 Off-center Desk Stands arranged for but less dials @ ..... $ 4.50

Auto-Elec. No. 21 Enclosed Gong Straight Line Ringer Boxes @ ..... $ 4.50

HOLZER CABOT!

The most dependable of all ringing machine—operates from 110 A.C. current — Rebuilt A No. 1 condition. $25.00.



Telephone Repair Co.
Daniel H. McNulty, Manager
Rogers Park Station Chicago

REPAIRING and REWINDING

Induction Coils
Ringer Coils
Generator Armatures
Receivers
Transmitters

Write for prices.

Buckeye Telephone & Supply Company
COLUMBUS, OHIO

FOR SALE:

Complete 5-pos. Leich central office equipment. Electrically restored drop magneto multiple swbd, 600 local lines, 20 toll, 60 rural; 75-pr. cords. Complete main frame with 680 Cook No. 10 protectors. 24-volt power and charging equipment. Leich pulsating harmonic ringing machine. 2-pos. Kellogg toll board; 30 toll lines; 20-pr. cord ckts. Equipment now working. Ready for del. Dec. 1. Jasper Co. Telo. Co., Rensselaer, Indiana.

IMPROVED
RARE GAS ARRESTERS

Avoid interruptions to service and provide full protection. Keep your lines clear and reduce maintenance expense. Interchangeable with other types.

New Vincent
RARE GAS
RELAYS

On rural party lines cuts out inductive interference, improves transmission; used with either coded or harmonic bells. EASY to install.

TEST-O-LITE

Handiest electrical tester made; Neon light quickly tells where trouble lies in electric circuits, fuses, cut-outs, motors, radios, appliances, etc. 1,001 uses for electricians. Tests any voltage 110 to 550; tells A.C. from D.C. Fountain-pen size; with pocket clip. Lifetime guarantee.

L. S. BRACH Mfg. Corp.
NEWARK, N. J. Estab. 1906
Oldest Makers of Rare Gas Devices

BARTLETT TREE TOOLS

The Combination Tree Trimmer and Pole Saw shown below has the advantage of serving the user as two distinct tools either one of which can be made into a long pole trimmer by simply adding extra sections to the head section. The Compound Lever Side Cutting Tree Trimmer will sever branches up to 1¼ inches diameter while the Pole Saw should be used on branches of larger diameter. The head sections of the WE Combination Pruner & Saw are 30 inches long and you may have as many extra sections as you wish for extending the handle length. No. 44 has 16 in. peg tooth blade with 7 teeth per inch. Saw is adjustable. Light weight.

The Pike Attachment illustrated herewith is interchangeable with the handle sections used on the tree trimmer & saw. The poles for these combination tools are all 1¼" Octagon Sitka Spruce, fitted with our quick-change sleeve which is self-locking. Extra sections 6 or 8 ft. long.

For destroying and preventing the growth of wood destroying fungi and for the protection of wounds, use Bartlett's Tree Paint, illustrated at the right. Easily applied with ordinary paint brush.

BARTLETT MFG. CO.
3052 E. Grand Blvd.
DETROIT, MICHIGAN

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STROMBERG-CARLSON SUPER-SERVICE

FOR ROCHESTER TELEPHONE CORPORATION'S NEW HILLSIDE EXCHANGE

Owing to continued growth, the Rochester Telephone Corporation has found it necessary to open a new exchange to be known as "Hillside".

Because of the Company's highly satisfactory past experience with Stromberg-Carlson's Super-Service Switchboards in all of the Rochester exchanges, the same type of switchboard was chosen for this new exchange.

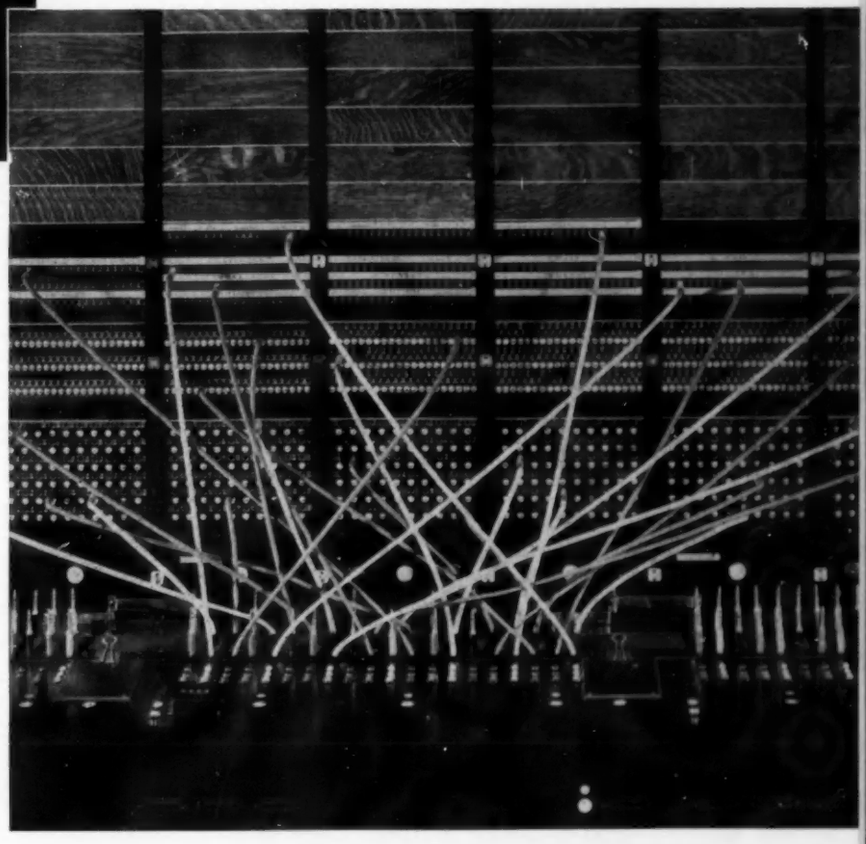
Like many other operating companies, the Rochester Telephone Corporation finds that the *twenty-one features* of the Stromberg-Carlson Super-Service Switchboard promote speed, accuracy and economical service.

These features are all illustrated and described in a special Bulletin, a copy of which is yours for the asking.

"A" and "B" Boards of Rochester Telephone Corporation's new Hillside Exchange

The Stromberg-Carlson Super-Service Switchboard is equipped with these features that give more speed and greater accuracy:

Operator's Ringing Control . . . Calling Subscriber's Ringing Control . . . Operator's Listening Indication . . . Instantaneous Ringing Cut-off . . . Reverting Busy Test with Tone . . . Instantaneous Ringing Start . . . Operator's Secret Service . . . Visual Ringing Indication . . . Advanced Plugging-in . . . Reverting Call Ringing . . . Audible Busy Test . . . Positive Supervision . . . Non-ringing Signalling . . . Emergency Ringing . . . Operator's Cut-in . . . Machine Ringing . . . Flash Recall . . . Dark Keyboard . . . Operator's Bar . . . Ringing Tone . . . Call Registration



Close-up of single position of Stromberg-Carlson Super-Service Switchboard in Rochester Telephone Corporation's new Hillside Exchange. Note the party line ringing buttons common to each position.

Stromberg-Carlson Telephone Mfg. Co., Factory and General Offices: 100 Carlson Road, Rochester, N. Y., U. S. A., Branch Offices: Chicago, Kansas City, San Francisco, Toronto

Stromberg-Carlson

MAKERS OF VOICE TRANSMISSION AND VOICE RECEPTION APPARATUS FOR FORTY-FIVE YEARS